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COMPUTING

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Volume I Number 2

POWER/PLAY

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ON THE COVER: The art from Commodore's **Adventureland** cartridge box is probably familiar to many of you. For the full story on challenging Scott Adams Adventure Games, see page 42.

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Braindrops

Hey, this editor job is no bed of petunias, you know. Allow me to level with you. I'm sitting here in my padded (this is the truth) office outside Wayne, Pennsylvania. Right now I'm all alone with my trusty CBM 8032 (you do not use a typewriter when you work for a computer company—a word processing program called Wordcraft is my only writing tool), trying to decide what you want to know so we can get it out to you. I'm making semi-educated guesses. My eyes are chronically bloodshot from staring at my CRT for prolonged periods. Not only that, but the incessant blinking of my cursor is making me a nervous wreck. It makes me feel as if my CBM is tapping its foot impatiently whenever I pause. So much for complaints.

The semi-educated guesses this time cover some pretty varied topics, from computer shopping to rhinoceros games. To paraphrase Mr. Lincoln: we're hoping somebody will find everything interesting and everybody will find something interesting. My personal favorite is the story about Scott Adams' Adventure Games, but that's just because I had so much fun doing the research.

Thanks to all of you who've sent us letters. The more input we get, the less we have to guess at what you want and need. I'm sorry we can't answer all of them, but if it looks like a lot of people are having the same problem or want the same information, we'll get it into POWER/PLAY. If you don't find it here, however, find (or start!) a user group in your area. User groups are terrific resources for novices and old-timers alike.

So here we go with the second issue. READY? LOAD. RUN . . . . . .

Diane LeBold

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We're Glad You Asked

Q Can VICMON and the Super Expander be used at the same time with the expansion module?
A No. Although some functions may operate correctly, some memory locations in each cartridge are the same, which would interfere with programming.

Q Can scrolling be made to reverse itself on the VIC 20?
A It is possible to make scrolling reverse itself with a machine language routine. However, there is no routine located in ROM that will accomplish this. The routine must be developed by individuals who wish to make scrolling reverse itself. (See notes from the Bucks County User Group, page 8.)

Q Are any commands assigned to function keys in the Programmer's Aid Cartridge?
A Yes. There are two sets of commands assigned to the function keys in the Programmer's Aid Cartridge. However, these commands can be redefined.

Q Is it possible to restore the VIC back to the unexpanded VIC with the expander cartridges plugged in?
A No, it is not possible to restore the VIC back to the unexpanded VIC with the expander cartridges plugged in. The cartridges must be un-plugged to restore the VIC back to its unexpanded mode.

Q What controls the clock on the serial I/O port of the VIC 20?
A The 6522 chip in the VIC has a crystal clock in it which controls the rate of transfer on the serial I/O port.

Q Where is the start of BASIC located when the 8K and 16K Memory Expander cartridges are plugged in?
A BASIC starts at 4096 decimal with the 8K and 16K Memory Expander cartridges plugged in. (See POKEing Around, page 54.)

Q Is the user port of the VIC 20 analog or digital?
A The user port of the VIC 20 is digital.

Q How much usable memory is available of the full 32K RAM in the VIC?
A There is 27½K usable memory available.

Q How can screen memory be moved around on the VIC 20?
A Screen memory can be moved around by altering the upper four bits of location 36869. This is the screen memory pointer location in the VIC chip. Also, you must tell the screen editor where the screen has been moved by POKEing the high byte of the starting screen address into location 648. Then warm start the system by either holding the run/stop and restore keys down or by typing the command: SYS 65234.

Q Where does RAM start on the VIC 20?
A RAM starts at 4097 decimal on the VIC.

Q As an owner of an early VIC 20 (serial #V003017), the mention of a VCU piggyback in the premier issue of Power/Play caught my eye. How can I acquire the Video Circuit Upgrade for my computer?
A Any VIC 20 with a serial number that starts with the letter V already has the VCU built in.

Attention Commercial Programmers!

Commodore is compiling a list of software commercially available for its computers. If you have software you would like to have included in this listing, please submit the following for review:

- copy of program on disk or cassette tape
- documentation describing the purpose and utility of the program
- information on price of program and where it can be purchased
- specification of equipment necessary for program to operate

Selected programs will be reviewed in POWER/PLAY, at the discretion of our Software Committee.

Please submit this information to:

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And Now A Word From Our Sponsor . . .

In the very near future we may all look back on 1982 as the year Commodore finally fulfilled decades of "futurist" predictions by making real computers affordable to the average household. At Commodore, the future is—and always has been—now. Already the relatively expensive predecessors of the VIC 20—and its powerful cousin the Commodore 64—seem as cumbersome and antiquated as mastadons.

Any major technological breakthrough—from the invention of the lightbulb right down to the creation of the first 6502 microprocessor at Commodore's subsidiary, MOS Technology—inevitably creates waves of change whose significance can be measured only much later. As Commodore moves forward with increasingly sophisticated computers that are also affordable, we can only guess at what the longterm effects will be.

But one thing we do know for sure is that you, as Commodore home computerists, are among the pioneers in a significant trend that could rapidly change our living habits. You are the ones who will make the "electronic cottage" foreseen by Alvin Toffler a reality, as you communicate with your friends and your work place, control your household energy consumption, teach yourself and your children math, social studies and computer programming, do your shopping and banking, compose music, create pictures, maybe even vacuum your floors—all through your computer. The technology for all these things is quickly coming into place. At Commodore we are committed to making that technology accessible to you, the consumer.

Greg Pratt
Operations Vice President

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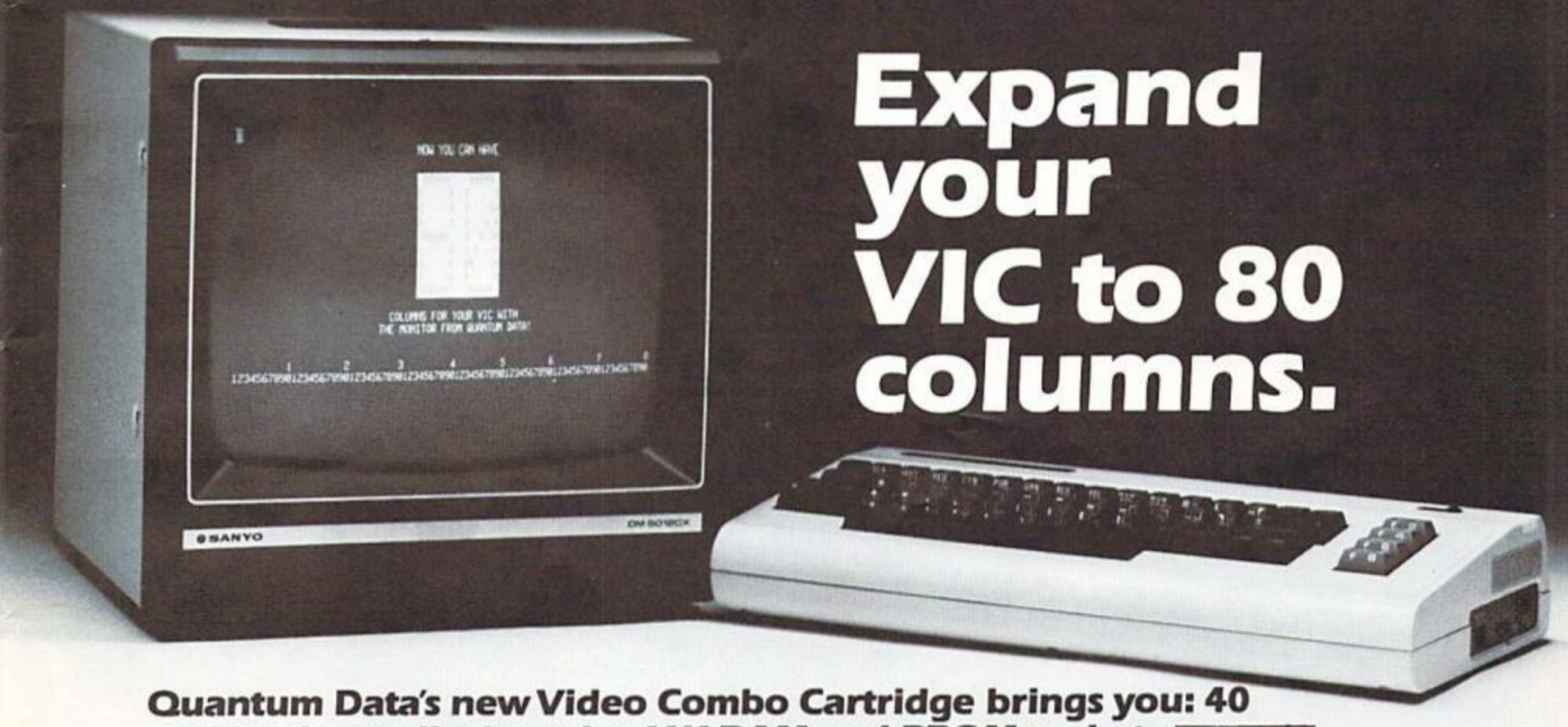

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QDI expandor:

- Expands Basic user memory up to 24K in 8K steps
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- 8K can be assigned to machine language area
- Plugs directly into VIC expansion port
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- Adds 3 slots to the memory expansion port
- Removable card guides allow either boards or cartridges
- Requires no additional power supply
- Fused to protect VIC power supply from overload
- Simple plug-in installation

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Access: Commodore User Groups

User groups have what we call a synergistic effect. That is, cooperative effort achieves things that individuals probably couldn't accomplish independently.

To encourage that cooperation, and help you get the most out of your home computing experience, this section of POWER/PLAY is devoted to getting users together.

Let us know what your group is doing, send messages via free "classified" style ads, or simply list your group. We'll do whatever works to help you contact other users and/or get the information you need.

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Commodore/PET Users Club
Conway Middle School
Davis Street
Conway, AR 72032
Geneva Bowlin

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1206 N. Fraser Drive
Mesa, AZ 85203
Paul V. Muffuletto

CALIFORNIA
Lawrence Hall of Science
UC Berkeley
Computer Project,
Room 254
Berkeley, CA 94720
415-642-3598

California VIC Users Group
"VIC-VILLE"
c/o Data Equipment Supply Corp.
8315 Firestone Blvd.
Downey, CA 90241
213-923-9361
Meet second Tues. of month

Valley Computer Club
2006 Magnolia Blvd.
Burbank, CA
213-849-4094
Meet first Wed. of month, 6 pm

Valley Computer Club
1913 Booth Road
Ceres, CA 95307

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Cupertino, CA 95014

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1450 53rd Street
Emeryville, CA
415-523-7396

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Fullerton, CA 92361
Dave Smith

Lincoln Computer Club
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Manteca, CA 95336
John Fung, advisor

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525 Crestlake Drive
San Francisco, CA 94132
Max J. Babin, secretary

PALS (PETs Around Livermore Society)
886 South K
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John Rambo

SPHINX
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Oakland, CA
415-451-6364
Every 2nd & 4th Thurs.

San Diego PUG
c/o D. Costarakis
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714-235-7626
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Walnut Creek PET Users Cub
1815 Ygnacio Valley Road
Walnut Creek, CA 94546

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805-937-4106
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Vincent Yaniello's VIC 20 Software Exchange Club
2130 Colby Avenue
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213-479-3000

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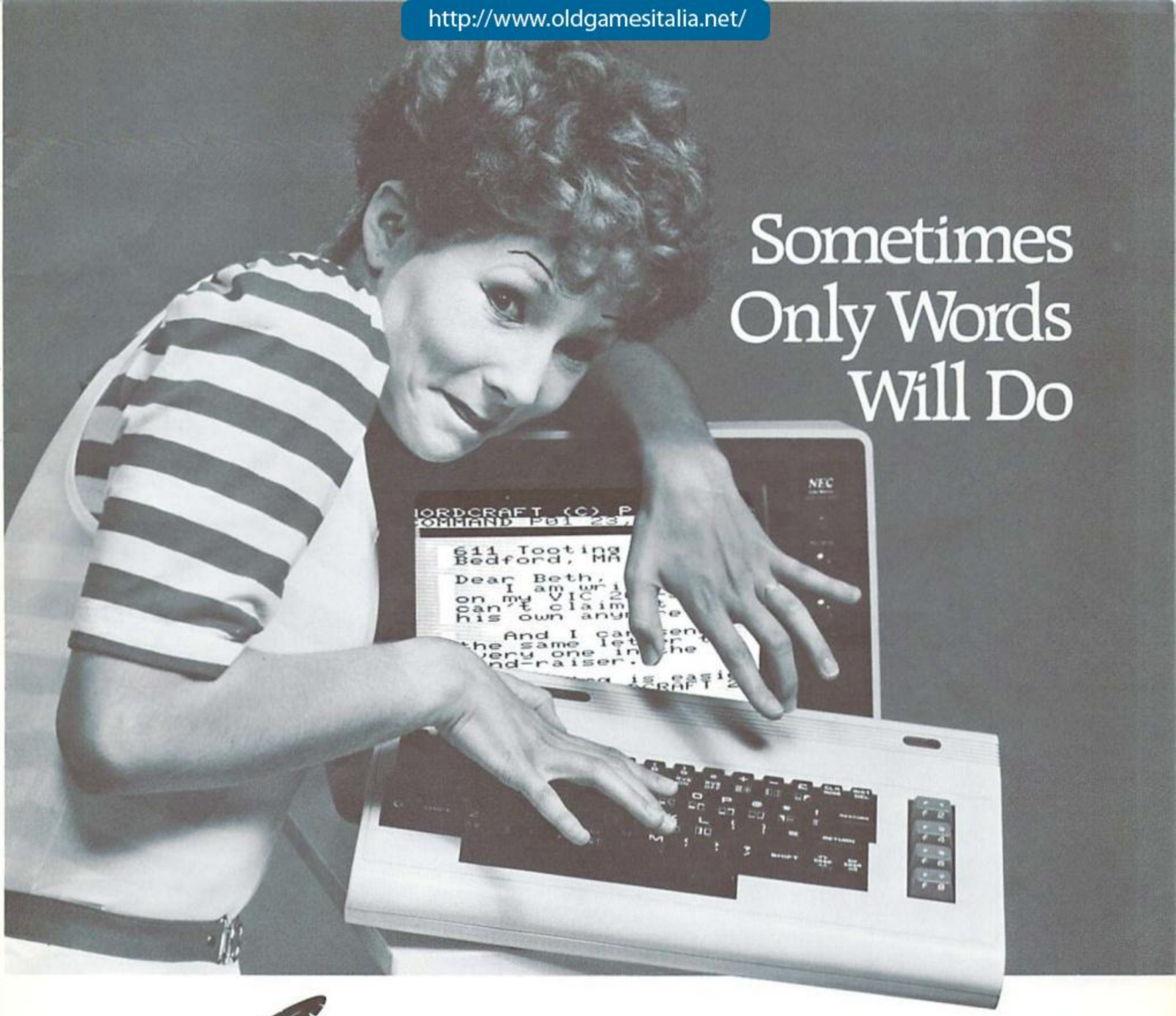

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Wordcraft 20© is easy to use; it won't confuse you. Your words will appear on the screen just as you've written them. This fully featured system lets you do what you need to do . . . change a character, a word, or an entire block of copy . . . arrange and rearrange the text . . . set the tabs and margins . . . adjust the line lengths . . . move the copy up and down, left or right, so you see every word on the screen . . . before you print. Wordcraft 20© gives you personal word processing with professional results. Plug Wordcraft 20© into your VIC® today . . . see for yourself just what words will do. Available exclusively from your local UMI dealer.

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User Group Spotlight

The Wichita VIC 20 Users Group

by Walt Lounsbery

Our group was organized as a specialized offshoot of a very informal Commodore users groups that met on the Wichita State University campus. The Wichita State meetings were the result of a Professor of Chemistry, Mel Zandler, providing the use of a chemistry lab for about a half-dozen friends to get together and talk computers.

However, during the fall of 1981 the lab became quite crowded with the influx of a few more people who had acquired VIC 20s and had heard of the Wichita State meetings. Since more and more VIC 20 owners were getting interested in getting together on a regular basis, we decided to find a larger meeting place and quit dominating Mel's lab.

John Ball, a technical writer at Beechcraft, organized the first few meetings and arranged use of a local computer store, GOSUB International. Over a dozen people showed up at our first meeting in February, 1982.

Most of the emphasis at our meetings has been on program and hardware demonstration, products announcements, programming tips and general news. There is no set of by-laws or elected officers. This seems to encourage interaction among the members, and prevents the meetings from dragging on.

However, the drawbacks of that arrangement became apparent at our April meeting when John Ball announced he had taken a position in Louisiana, and a new chairperson would have to be found. No nominations came from the floor; nobody even volunteered! Therefore, Walt Lounsbery was appointed to the office of General Manager and Editor, over his heated objections.

As of June, just five months after the first meeting, the Wichita VIC 20 Users Group amounted to 45 members from all sorts of backgrounds. One even lives in New York, which makes it tough getting to meetings. We expect that number to double by the end of the year.

We publish a monthly newsletter with several programs, articles by the members, the latest news, classified ads for the members at no charge, and commercial advertising at reasonable rates. In addition, we maintain a public domain software library that includes useful utilities, several games and some obstruse programs such as "Airfoil Moment Coefficients by Thin Airfoil Theory". In the future the risky business of sending cassettes through the mail will be avoided through the use of modems.

The area Commodore stores and dealers have been very generous in their help and support through discounts, ads in the newsletter and other invaluable aid. To be particular, those are GOSUB International, Computer Business Machines, Inc. and Mycro-Tek.

Although our group is very successful because of all the services it renders to the membership, perhaps the best reason for such a group is to promote interaction between people interested in the VIC 20 or Commodore products.

Our members have helped each other with light pen construction, appending programs, use of various VIC cartridges and peripherals, and on and on. Even more important, people who attend our meetings get straightforward answers to their questions without feeling pressured by sales staff in any way. These people often go ahead and purchase a Commodore system after getting swamped by advice from our diverse group, which must say something for Commodore products. Some even join our group!

User Hints

From the Bucks County (PA) VIC 20 Users Club Newsletter

BACKWARD SCROLL

To scroll the screen backward on the VIC, Print "Home Down Back Insert Space." Then Poke 218,158 to tell the VIC that the second row is not a continuation of the first row.

PRINTING IN THE BOTTOM RIGHT CORNER

To print in the bottom right corner of the screen an X, and to the left of the X a __, for example, Print Tab (20) "X Back Insert __ (Up or Home)." The Up or Home is necessary so that the VIC will not scroll the screen and remove the X from the corner.

An alternate method for printing characters in the bottom right corner is to print the entire 23rd row in the 22nd row, and scroll the screen backward as described above.

KILLING COMMODORE/SHIFT

To kill the Commodore/Shift key, Print Chr$(8). To lock the VIC onto upper/graphics or upper/lower Print Chr$(142) or Chr$(14) respectively. If a program will be in one of these modes, it saves memory to let N$ (Program name) = N$+Chr$(8) + Chr$(142) or Chr$(14). Save N$. When the VIC tells you that it has Found N$, it will lock itself into the mode of your choice.

A Short Biography For The Record

Walter Lounsbery is an Aircraft Performance Engineer and Aerodynamicist at the Boeing Military Company. Age 27. He has been involved in computer hobby and electronic logic design since the ancient era of 1975, and has been programming since 1973. He moonlights in engineering consulting, but the demand for computer consulting tends to dominate his business. Although no one believes he hates to program computers, most seem to appreciate programs that run well as much as he does.

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VIXEL™

Vixel Volume One

Fire

Fly a water-dropping helicopter, and try to put out the high-rise fire before it spreads.

Draw

Be an artist! This high-resolution drawing program makes it easy to create pictures on the screen, and then save them on tape.

Race

Race the computer, head-on! Simple but lots of fun.

Vixel Volume Two

Superfont

Design programmable characters on your VIC-20 with this easy-to-use program. Especially useful when creating animations, since you can edit four characters at once as a 2 × 2 block. SUPERFONT creates DATA statements after you have finished designing the characters.

Safari

You are a photographer on an African Safari in this great game. The jungle animals run past as you try to snap their pictures. An excellent example of how to use large blocks of programmable characters on the VIC to create animation effects.

Quix

How good is your memory? QUIX presents patterns of color and sound that gradually get longer and harder to remember.

The programs Fire, Draw and Race are available on VIXEL Volume One for only $12.95. The programs Superfont, Safari and Quix are available on VIXEL Volume Two which is also $12.95. Both Vixel #1 and Vixel #2 work with the standard 5K VIC-20. Foreign orders add $3.50 for shipping. CA residents add 6% tax. VISA and MasterCard welcome. Please add $1.00 shipping for credit card orders.

VIXEL is a trademark of The Code Works.
VIC-20 is a trademark of Commodore Business Machines.

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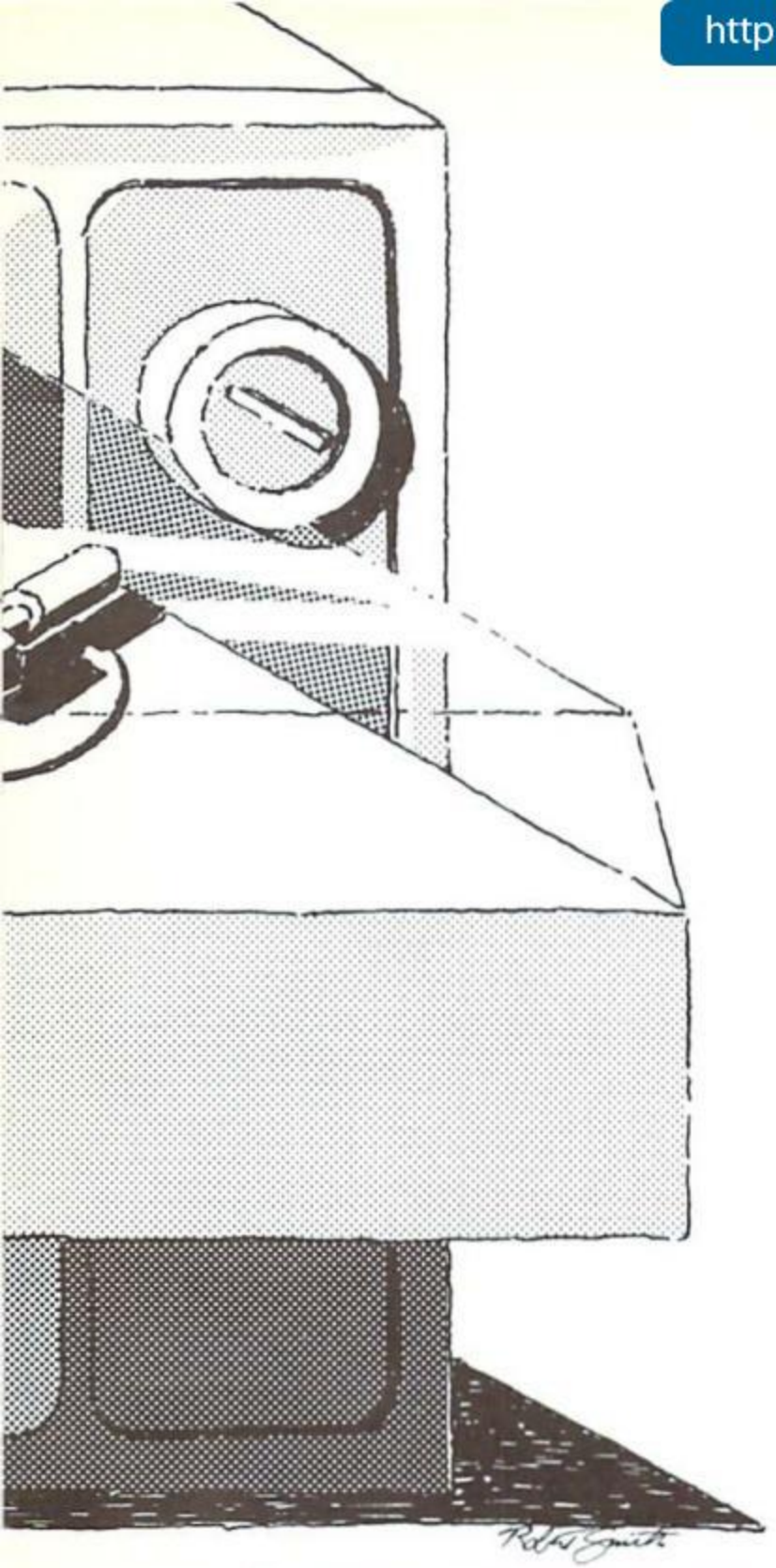

Through This Shop-At-Home Database You Have Access To Discounted Name-Brand Merchandise From Suppliers All Over The Country— Delivered To Your Door.

So you're thinking about getting a new stereo system—or maybe a dishwasher—or a cassette player for your car. You watch for sales, you compare prices, you check catalogs, looking for the best deal. Meanwhile prices keep inching upward and you start thinking if you don't buy it now you may not be able to afford it in a couple of months.

To buy or not to buy—and where. Don't you wish you had a private hotline so you could scan all the prices on that microwave oven you want, to find the best buy?

Guess what. With your Commodore computer and modem you DO have exactly that—a private hotline for finding discount prices—when you subscribe to the Compu-U-Store shopping service (formerly known as Comp•U•Star).

Using Comp-U-Store, you have access to price quotations and descriptive information on thousands of name-brand products from suppliers throughout the U.S., all offered at prices 10-40% lower than manufacturers' suggested list price. And not only does the database find you the best available price on the model you want, but you don't even have to leave your house to pick it up, because it's delivered right to your door—or the door of whomever else you request—"in factory sealed cartons with full manufacturer guarantees and warranties in effect," to quote Comp-U-Store. Just charge the purchase on your Visa or MasterCard or send in a check when you order. Comp-U-Store's very easy to get along with.

If you're anything like my mother, you're probably already trying to find the cloud in all this silver lining. I have to admit I was a bit skeptical, too. But, after I talked with several people who use the service and played around with it myself, I found out that, while the system isn't perfect, it does seem to be a workable method for getting good deals on certain products. Especially after you learn a few little tricks for using it efficiently.

Although you can become an individual member of Comp-U-Store, many people find out about the service when they subscribe to one of the telecommunications networks like CompuServe or The Source, both of whom now carry the Comp-U-Store database (which is not to be confused with The Source's own shopping service—a separate system). Steven Tanzola of Narberth, Pennsylvania, for instance, logged onto The Source one night and found an announcement about Comp-U-Store.

"I was interested in buying some things, so I decided to take a look and see if it could save me money," Tanzola, a systems consultant for small businesses, said. "I found out the savings were quite extensive."

Tanzola bought a cassette deck, a turntable and a telephoto lense through the service, delivered to his door in about 2½ weeks, although Comp-U-Store says you should allow 4-6 weeks for delivery on most items.

"As a former camera dealer, I knew what the prices on the telephoto lense should be," the young marketing expert went on. "The Comp-U-Store price was lower than what I would have paid as a dealer."

Tanzola said the system also helped him choose a cassette tape deck that turned out to be a better deal than the model he had originally planned to buy.

"When I went into the system to order the tape deck, it asked me what features I was looking for as well as the price range, and narrowed it down to 10 or 12 items for me to look at, based on the features I wanted," he explained. "I thought I knew what models I wanted when I went in, but the system recommended some models I hadn't considered. I ended up purchasing a tape deck that had more features than the other models I'd considered—at a lower price."

(continued on page 12)

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(continued from page 11)

Or take John Alpi and Henry DiRocco, National Account Sales Manager and System Support Manager, respectively, at CPT Corporation in New York City—right on Park Avenue. CPT has a group membership to Comp-U-Store, providing people with access to the service.

Living in New York, in Alpi's words, "spoils you when it comes to buying things—because you can always negotiate a price." You have to know exactly what you're looking for, he goes on, but if you do, New York is a "good place for bargains."

Yet even seasoned shoppers like Alpi and DiRocco admit Comp-U-Store provides some "substantial" savings.

"I was shopping for a tape deck (using Comp-U-Store)," DiRocco explained, "and I happened to find the same model I knew John had been looking at in the stores . . ."

"It was about $50.00 less than the store price," Alpi elaborated, "and MUCH less than the list price." He ordered the tape deck and 15 days later it was delivered.

Both Alpi and DiRocco also like to play around with the service's weekly auction, called Comp-U-Stakes, where a popular item is put on the auction block for competitive, interactive bidding. DiRocco, in fact, was unexpectedly the high bidder on a microwave oven one week. But he declined it, he says, because "I didn't need it. I just wanted to try the auction and I kind of got carried away."

Out in Illinois, meanwhile, Randy Zarecky and his wife bought a dishwasher and a microwave through Comp-U-Store for their newly remodeled kitchen—and saved over $300 on each item.

"It cost me about $55.00 (in hook-up charges) to save $600.00," Zarecky said, adding that he thinks his subscription to the service has been "definitely worth it."

Zarecky, who found out about the shopping service through his subscription to CompuServe, was also very happy with the delivery of his appliances.

"They were delivered by a standard freight line, and, since my wife and I both work, we were worried that we'd miss the delivery," he said. "But the freight line called the night before to tell us they were going to deliver the next day."

The users I talked to all agreed Comp-U-Store is easy to use. No one seemed to have any outstanding problems getting around in the system. But everyone also had one major suggestion for cutting back on hook-up time and frustration: Do your homework before you go into the service. Don't use it just to browse, unless, of course, you don't mind paying the price (30¢ a minute prime time and $8\frac{1}{3}$¢ a minute non-prime time, to be exact).

"The best way is to have model numbers before you begin, because everything is listed by model number, Steven Tanzola said. "Check stores or consumer reports ahead of time, so you know what you're looking for."

John Alpi and Henry DiRocco agreed. "It's real simple, once you know the manufacturer's code and model number," DiRocco pointed out, "but you can still use the 'help' command to get that information."

It also helps to know what features you're looking for, because product descriptions appear in an abbreviated form that might be a little hard to decipher at first. Among the people I talked to, however, I seemed to be the only one who had that problem. So maybe it's just me.

Among the users I talked to, everyone did agree it would be difficult to choose certain items sight-unseen via the service—things like jewelry, clothing, china—that involve personal taste.

"If I were going to buy something for aesthetic reasons—like clothing or jewelry—I would want to go and look at it first," Steven Tanzola explained. "But then I might go back in and order it."

Henry DiRocco agreed. "Any clothing or items of a personal nature I wouldn't buy sight unseen," he said. "You really can't tell from the descriptions of those kinds of items . . . 'Gold leaf with Spartan design' . . . what can you tell from that?"

"But," added John Alpi, "any appliance—a camera, or anything like that—I'd buy there in a minute."

Comp-U-Store is the high-tech offspring of Comp-U-Card of America, a nine year-old telephone shopping service operating out of Stamford, Connecticut.

"Comp-U-Store was really the logical extension of our service," said Walter A. Forbes, Chief Executive, Comp-U-Card. "We knew in 1973 that electronic shopping was going to be the wave of the future. With the '80's, we'll see an even wider acceptance of computers as part of everyday life."

According to Hsueh-wei Wang, Director of Consumer Electronic Services at Comp-U-Card, the next logical addition to the service's repertoire would be to transmit a picture of each product to the home computer screen. (That would make Steve Tanzola, John Alpi and Henry DiRocco happy.) Ms. Wang said her company is, in fact, doing just that with some success in several national retail chain stores, via laser disk.

"Ideally it would be great to bring pictures to the home," Ms. Wang said with characteristic enthusiasm, "but right now the technology is fairly complex." Nevertheless, she is optimistic that in the future it will be possible to view the product before you buy on the Comp-U-Store system.

So don't just sit there wishing you had some kind of genie to find you the best price on that electric range you need so desperately. Get on your computer and buy, buy Comp-U-Store.

—Diane LeBold

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Let your computer do the shopping and save 10%-40% off list on brand-name products

Introducing comp-U-store — the world's only complete shop-at-home service for home computer users.

IMPORTANT QUESTIONS AND ANSWERS ABOUT COMP-U-STORE

Q. Are there any minimum time charges?

A. No. There is no minimum connect or monthly charges. Each time you "log on" with Comp-U-Store you will be charged as little as 8½¢/minute, among the lowest of the information services. Your monthly connect time charges will be billed to your Visa or Master Card account.

Q. Can anyone make unauthorized purchases on Comp-U-Store in my name?

A. It's virtually impossible. In order to "log on" with Comp-U-Store the user must enter a 4-level security sequence. These numbers are strictly confidential.

Q. Do any of the products come with guarantees?

A. All products sold through Comp-U-Store come with full manufacturer's guarantees and warranties. All merchandise is delivered directly to your home.

Q. What if I have a question or problem regarding a product ordered through Comp-U-Store?

A. No problem. Just call our Customer Service Dept., toll-free, at 800-243-9000 (in Connecticut, 800-942-3315), and we'll take care of you right away.

Now you can shop from your home and save up to 40% off list on over 50,000 top quality brand-name products. Comp-U-Store adds a new dimension to your home computer, which is already capable of performing many helpful, time-saving tasks. Now, you can save even more time — and money — shopping at home with your computer.

You can use Comp-U-Store to browse at your leisure. There are no salesmen to pressure you. No crowds to fight. You select and purchase the exact merchandise you want, in a matter of seconds.

Stereos, cameras, appliances, luggage, TV/video equipment — virtually any product you'd find in your department store or specialty shop is at your fingertips. Choose from over 200 top name brands: Sony, RCA, Seiko, Nikon, GE, Whirlpool, and more!

Comp-U-Store is a service of Comp-U-Card of America — the nation's leading telephone shopping service. Serving nearly 2 million shoppers, Comp-U-Card has over 7 years experience finding the best products at the best prices.

Easy to Use Comp-U-Store is remarkably easy to use. All you need is a telephone, a "dumb" computer terminal and a modem. A VIC20 and VICMODEM or practically any personal computer or data terminal capable of data communications will do.

Easy to Order To order a product through Comp-U-Store, you simply enter the product information, shipping instructions and method of payment, and you're all set. Your products will be delivered right to your home, or whatever address you specify.

Easy to Pay You may pay for merchandise by personal check, Visa or Master Card. You can even spread a single Comp-U-Store purchase over *more than one* credit card, if you wish.

Now you can join the thousands of home computer users already saving money by using Comp-U-Store's complete shop-at-home service.

To become a Comp-U-Store Member, simply complete and return the special *POWER/PLAY* READERS COMP-U-STORE MEMBERSHIP APPLICATION below.

When we receive your Membership Application, we'll rush you your confidential system access codes and User's Manual.

Money-Back Guarantee

If you are not completely satisfied with Comp-U-Store you can cancel your Membership at any time, and receive a full refund of your Membership Fee. (You are, however, responsible for any outstanding connect time charges.)

COMPLETE, DETACH AND MAIL THIS FORM TODAY ★★ JOIN COMP-U-STORE AND START SAVING! ★★

comp-U-store

Mail this form to:
Comp-U-Card of America, Inc.
777 Summer Street
Stamford, CT 06901

Yes, I want to start saving money on top quality brand name products by joining Comp-U-Store. Please send my confidential system access codes and User's Manual. I understand that annual membership renewal fees and monthly connect time charges will be automatically charged to the credit card indicated. I also understand that, if at any time I'm not completely satisfied, I may get a *full refund* of my Membership Fee.

POWER/PLAY READERS COMP-U-STORE MEMBERSHIP APPLICATION

Name (Please Print) _____

Address _____

City _____ State _____ Zip _____ (Required to process your application)

Home phone ( ) _____

Business phone ( ) _____

CHECK ONE:

☐ One year membership @ $25.00

☐ Two year Membership @ $40.00

INDICATE METHOD OF PAYMENT BELOW

☐ Visa ☐ Master Card

Card # _____

Expiration Date _____

Signature _____ (Required to process your application)

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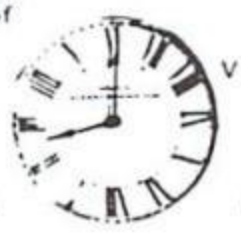
V 1 MONEY ADDITION
Simple drills on adding amounts of money. 4th-5th grade. $9.95

V 2 MATH WHIZ
Two person drill on the elementary math functions of multiplication, addition and subtraction. Elem. $9.95

V 3 MY BODY
Drills children on the names of parts of the body. Elem. $9.95

V 4 TESTER
Tester from Commodore. It tests the color and sound features of your VIC-20 and color T.V. Utility. $1.95



V 5 CLOCK
Large digital alarm clock with color and sound. $4.95

V 6 FOUR ACROSS
Vertical game for two players; similar to tic-tac-toe. $9.95

V 10 SNAKE
Like the Arcade game SURROUND. One or two players. $9.95

V 12 BREAKOUT
Adaption of the classic Ping-Pong against the wall. All time favorite. $9.95

V 13 GRAPHIC DEMO
VIC demo from Commodore. Patterns, color, and special effects. $1.95

V 15 ALPHABET
This leaves one letter of a group of letters out. The child must fill it in. Elem. $7.95

V 16 SOUND EFFECTS
VIC demo from Commodore. Tells what kind of sound effects are possible on the VIC. $1.95

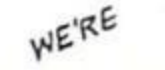
V 17 SPELLING
A word appears on the screen and then disappears. The student must then spell the word which just disappeared. Elem. $7.95

V 18 PLURALS
The computer gives the student a word and the student must decide if the word is plural or not. Elem. $7.95

V 19 NUMBER NAME
Here the student is given either a number or the name of a number. The student must then give the number or the name of the number. Elem. $9.95

V 20 MIX-UP
This program takes words and scrambles them. The student must then unscramble them. $9.95

V 21 CONTRACTIONS
This program gives the student a contraction or two words, and the student must fill in the two words which the contraction was originally, or form a contraction from the two words. Elem. $9.95



V 22 PRINT COMMANDS
Explains how to use the print command, commas, semi-colons, tabs, strings, and other ways to print. H.S. $14.95

V 23 FOR-NEXT LOOPS
Explains what they do, the loop counter, step, limits, and applications. H.S. $14.95

V 24 GRAPHICS
Many people buy VICs because of the incredible graphics capabilities. This lesson shows and explains many of the tricks of good graphics. H.S. $14.95

V 27 TYPES OF VARIABLES
Integer, real, floating point, binary, string, they are all explained and illustrated. H.S. $14.95

V30 SUBSCRIPTED VARIABLES
Until you master x(j) and how one symbol stands for a whole class of numbers, your computing ability is limited. $14.95

V 31 DATA FILES
Whether you have a 3, 11, or 32K VIC, you have limited storage. By using data files, your storage is unlimited, but it is not easy to master the details. H.S. $14.95

V 33 HISTORY OF COMPUTING
Traces history from earliest forms of calculators to modern electronic computers. H.S. $14.95

V 34 FOUR MAIN PARTS
From the biggest IBM to the tiniest one chip computer, you always have INPUT/OUTPUT, memory, arithmetic, control. H.S. $14.95

V 35 RANDOM NUMBERS
It is impossible to create interesting games and simulations without a basic mastery of random numbers. H.S. $14.95

V 38 THE VERB
Covers action verbs, linking verbs, and verb phrases. Elem. and up. $14.95

V 39 THE ADVERB
Explanation and examples of how adverbs can modify verbs, adjectives or other adverbs. Elem. and up. $14.95

V 40 THE ADJECTIVE
Explanation and examples of how adjectives modify nouns, serve as predicate nominatives and possesive adjectives. Elem. and up. $14.95

V 51 DIAGRAMMING SENTENCES
Student is asked to supply the subject, predicate and object of many simple sentences which automatically appear in diagrammed form as he progresses. Gr. 4 and up. $9.95

V 54 END PUNCTUATION
This program is used to teach three different kinds of punctuation that can be used to end sentences. Elem. $9.95

V 56 TACHISTOSCOPE
This program flashes small groups of words on the screen in a random order. The student attempts to read and reproduce the words. The student can increase the speed of presentation. Elem. $9.95

V 60 MATCHING WORDS
The student is asked to discriminate between words that are identical and words that are very similar. SOUP SOUP is a match, but SOUP SOAP is not Kind. & First grade. $9.95

V 63 ADDING SIGNED NUMBERS
This program drills you on adding positive and negative numbers. Jr. H.S. $9.95

V 64 TIMES
The computer drills you on multiplication. Elem. $9.95

V 65 FRACTION REDUCTION
The computer puts a fraction on the screen and you must type in the reduced fraction. $9.95

V 67 ALPHABETIZING
You are given two words and you must decide which one will come first in alphabetical order. Elem. $9.95

V 70 COUNTRIES
This is an educational program which tests to see if you know the location of various countries in the world. Jr. H.S. and up $9.95

V 71 LETTER SEQUENCE
One letter of the alphabet will be blanked out and you must type in the missing letter. Preschool and Kindergarten. $7.95

V 72 SILENT LETTERS
The computer displays a word on the screen, and the student must choose the silent letters in the word. Elem. $7.95

V 74 LETTER MATCHING
The computer gives you the small letter and you must type in the matching capital letter. Preschool and Kindergarten. $7.95

V 75 GUESS MY NUMBER
You must guess the computer's number which is from 1 to 100, in as low a number of moves as possible. $7.95

V 76 SPELL
Here you tell the computer the words you have trouble with. The computer scrambles the words and you must spell them correctly. $9.95

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V 77 LETTERS
You must guess the letter which the computer is thinking of. The computer gives clues if you guess wrong. $7.95

V 78 BRICK
The computer has a brick float across the screen and it disapoears before it hits the window. You have to stop the brick before it breaks the glass. $7.95

V 79 SHOOT
You have to shoot a moving object. The game has five different skill levels. $7.95

V 80 REVERSE
This game is played with two sets of pegs. The board starts with a set of pegs at each end and you must reverse them. $7.95

V 81 CAPTURE
You have to capture the two beasts by containing them in the brick cage that you build. It has nine skill levels. $9.95

V 82 WORLD CAPITALS
An entertaining and educational variation of STATE CAPITALS. $9.95

V 83 JACKPOT
You must see this one armed bandit in action to believe it. Full color graphics and sound. $7.95

V 84 STATE CAPITALS
The computer displays a state or capital; the student types in the corespondinq capital or state. Even corrects spelling mistakes. $9.95

V 85 HANGMAN
Unbelievable graphics and sound with a twist of humor. Kids of all ages will love this one. $9.95

V 86 TIC-TAC-TOE
The perennial favorite, a fast-paced colorful game. Try if you can to beat the VIC. $7.95

V 87 MEMORY
The VIC challenges your memory to the ultimate degree. Just like the old T.V. show Concentration. $9.95

V 88 MATCH
Hand and eye coordination are a must in this game. Beat the clock and get the maximum number of points. $7.95

V 89 MONKS
A devilish game of logic. It will have you glued to the VIC for days. $7.95

V428 INTRUDER-SCRAMBLE
Just as fine as the arcade game. A must! $19.95

V 90 MOSAICS
A variation of Rubics cube for the VIC. This game has never been seen before for any computer.. We wrote the program but could not solve the puzzle. $9.95

V 91 SENKU
If you like thinking logically, this one will challenge you all the way! Based on the popular game of Mastermind. $7.95

V 92 MAGIC PAD
A mini-version of Visi-Calc for the VIC. Allows storage and retrieval of data from cassette; invaluable for personal and business use. Turns VIC into the perfect record keeper. $20.00

V107 BINARY NUMBERS
This program is designed to introduce you to the binary number system and the conversion to binary from base 10 numbers and back. $9.95

V108 BOMBER
You must decide who you want to fly for. You then get to pick a target and your experience level. $9.95

V151 BIZZ-BUZZ
Math game that tests the student on division by 2&3. Good for elementary school students. With color and sound. $9.95

V152 MISSILE COMMAND
You have three bases and you must destroy as many space ships as you can before you run out of missiles. $9.95

V153 TANK VS. UFO
The tank is moving back and forth along the base and you must shoot the UFO before it shoots you. $9.95

V156 ACEY DEUCEY
This is a game in which the computer deals two cards face up and you must bet on whether or not the next card will have a value between those first 2 cards. $9.95

V180 ARTIST
This program allows you to draw a picture on the screen and then save it for another day. $4.95

V184 HEX MONITOR
This program allows you to enter codes in hexadecimal directly from basic. It will also convert decimal to hexadecimal or hexadecimal to decimal. $9.95

V185 MATH DICE
This program displays the dice on the screen and you must tell the computer the correct sum of the dice. Elem. $9.95

V186 ROOT FINDER
Finds roots to complex polynomials. $9.95

V187 TUTOR MATH
This program is designed to help students with adding and subtracting signed numbers. $9.95

V188 HIGH RES. DOODLE - JOYSTICK
Use the joystick to draw high resolution pictures on a 4096 dot screen. You can save to a tape for future viewing. Special graphic fuctions, reverse picture, and reverse section. $7.95

V189 HIGH RES. DOODLE - KEYBOARD
Same as High Res. Doodle (V189) but used through keyboard control. $7.95

V190 BIORHYTHM
Just like the biorhytnm charts you find in books. $9.95

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The VIC Is A Super Calculator

by Michael S. Tomczyk

Reprinted from Commodore Magazine, February, 1982

Like any computer, the VIC is a super calculator . . . and you don't need a special cartridge or add-on to make the VIC "Calculate!"

VICBASIC, the language of the VIC, has a full mathematical operating system built into it. The special symbols you use to perform mathematical calculations are called *arithmetic operators*. These operators are discussed in the VIC owner's guide, and in the *VIC 20 Programmer's Reference Guide*.

VIC operators include the following symbols:

- − minus sign (subtraction)
- + addition sign (addition)
- / fraction or division sign (division)
- * asterisk (multiplication)
- < less than
- > greater than
- = equal sign
- ↑ exponentiation

These symbols are located conveniently on the keyboard so you can use them quickly and easily. For example, the +, −, *, /, ↑ and = signs can all be typed in without having to SHIFT. They are grouped on the right side of the keyboard.

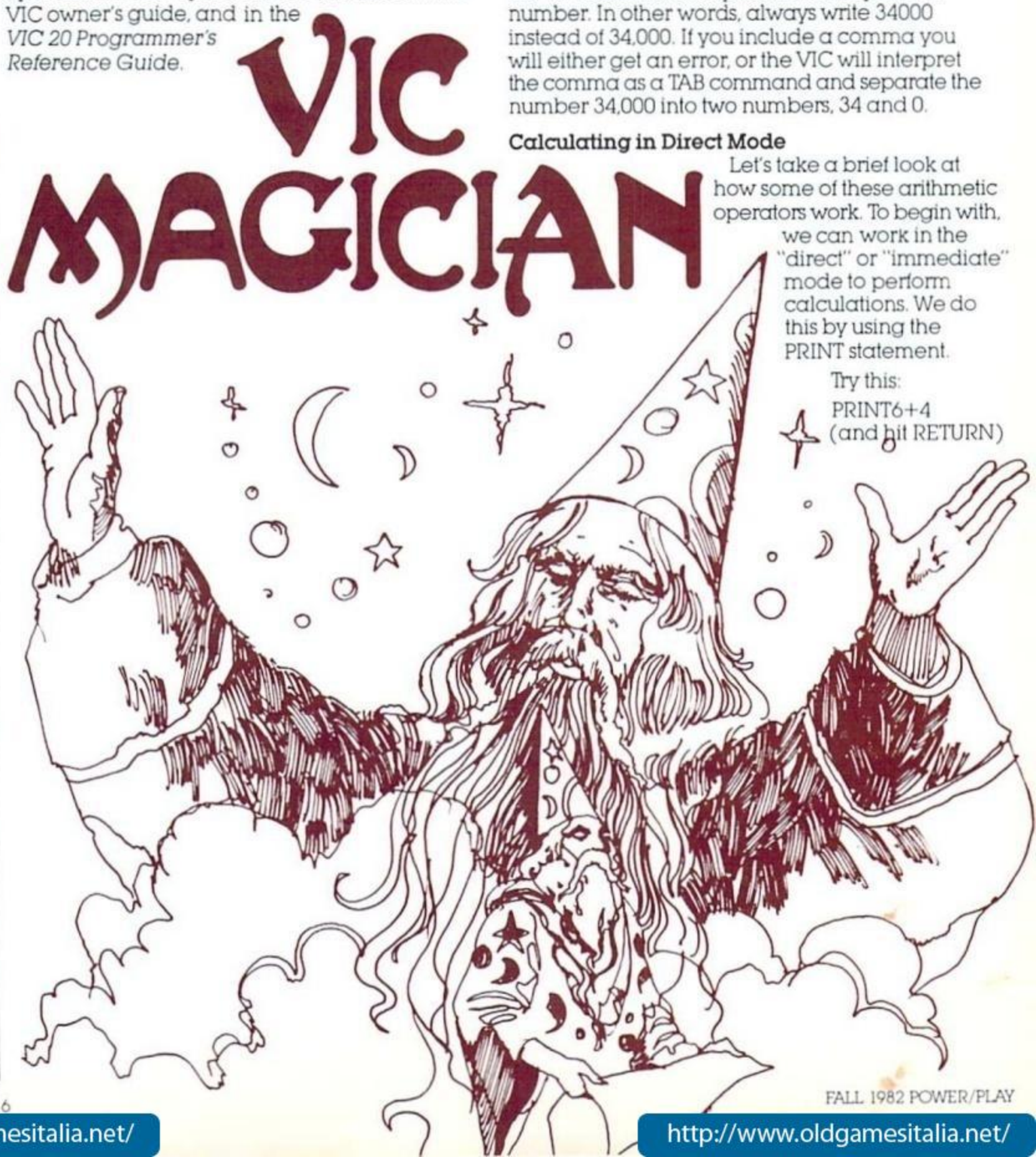
Before going any farther, please note that the VIC does not accept commas as part of a number. In other words, always write 34000 instead of 34,000. If you include a comma you will either get an error, or the VIC will interpret the comma as a TAB command and separate the number 34,000 into two numbers, 34 and 0.

Calculating in Direct Mode

Let's take a brief look at how some of these arithmetic operators work. To begin with, we can work in the "direct" or "immediate" mode to perform calculations. We do this by using the PRINT statement.

Try this:

PRINT6+4
(and hit RETURN)



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The VIC responds by immediately performing the calculation . . . and PRINTs the answer . . . 10. Note that you DON'T USE QUOTATION MARKS when using the PRINT statement to do calculations. Try these two examples to see why:

PRINT "6+4" (hit RETURN) The VIC displays 6+4 instead of 10.

PRINT "The sum of 6+4 is" 6+4 (RETURN). VIC CALCULATES Numbers OUTSIDE the quotes, but PRINTs the numbers and words INSIDE the quotes. This is a useful technique to remember.

Mathematical Calculation—Examples & Notes

Addition
PRINT500+1000

Subtraction
PRINT6−4

Multiplication
PRINT5*5

Computer multiplication uses the * (asterisk) instead of the X (times) sign to avoid confusion between the multiplication sign, the letter x, and the graphic symbol X. Just remember that when you are using your VIC to multiply numbers, the asterisk (*) is used instead of the (X) times sign.

Division
PRINT10/5

Division on the VIC uses the fraction symbol (/) instead of the division sign (÷). To divide 10 by 5, type 10/5 instead of the conventional 10÷5. The VIC gives you the answer 2.

Fractions
PRINT5/10*10/5

Fractions are handled like normal fractions. 5/10 multiplied times 10/5 equals the whole number 1 and that's the answer the VIC gives if you type in this example.

Decimals
PRINT5.2/5.8

The answer to 5.2 divided by 5.8 is .896551724. The VIC handles decimal answers in the range from 0.01 to 999,999,999 in standard notation, but numbers beyond this range are automatically converted to *scientific notation*. This means that if a number is too large to conveniently display or work with, it is converted to a shorter "scientific" form (see below).

Negative Numbers
PRINT−5*10 . . . or . . . PRINT−5*−10

The VIC recognizes and handles negative numbers, but complex formulas may require parentheses to keep negative numbers from being confused with subtraction operations. For example, −5 might be typed as (−5) if there are many operations in a single calculation.

Exponents
PRINT2↑2

This means PRINT 2 to the 2nd power, normally written as 2^2 (or 2 times 2). The VIC uses the up-arrow to show this. 10 to the 3rd power (10 times 10 times 10) is written in VIC terms as 10↑3 . . . (1000). If you're not familiar with exponentiation, 10↑3 means takes the first number (10) and multiply it times itself 3 times. 5↑2 means multiply 5 times 5 (or 25). Exponentiation is important because it is used by the VIC to designate numbers that are too large to express in normal form.

Using Pi

One of the VIC's special characters is the "pi" symbol. Pi looks like this: π, and is located on the **front of the up-arrow key.** You can print or display the pi symbol like any other character, but pi can also be used as a **value** like a number. The value of pi is 3.14159256 . . . etc. and represents the ratio of the circumference of the circle to its diameter. If you multiply the diameter of a circle by pi you will get the circumference. To use the VIC's pi character, simply hold down the SHIFT key and press the pi key. Try typing the following:

PRINTπ

The VIC responds by displaying the number 3.14159265. Now let's say you wanted to calculate the circumference of a circle with a diameter measuring 5 inches. Simply type: PRINTπ*5 and hit RETURN. The VIC answers 15.7079633. Likewise, you can find the diameter of a circle by dividing a circumference by pi.

The Order in Which VIC Calculates

If you are using a complex formula or several mathematical operations in a long calculation, the VIC will always calculate in the same order . . . according to the **type of operation.** The order in which the VIC examines a calculation or formula is: 1) exponents, 2) multiplication and division, 3) addition and subtraction. If there are several calculations in the *same category*, the VIC performs them starting **from left to right.**

This is especially important if you are using the VIC to solve equations and perform multi-operation calculations or formulas.

You can force the VIC to calculate in the order you want by using parentheses ( ) to isolate operations you want performed separately, in which case the VIC calculates starting with the operation in the **innermost parentheses.**

Let's look at an example. Type in the following and hit RETURN:
PRINT10*2↑2/4+3−2

In this formula, the VIC will perform the calculation in the following order: first the exponentation is considered. Next comes multiplication and division, followed by addition and subtraction. If there are several operations of the same

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type, they are performed in order from left to right. We can use parentheses to show you better how the VIC actually sets up this calculation. The VIC performs the calculations in order as shown and displays 11 as the answer.

Calculation Trail	Specific Operation Each Time
10*(2↑2)/4+3−2	2*2 = 4
(10*4)/4+3−2	10*4 = 40
(40/4)+3−2	40/4 = 10
(10+3)−2	10+3 = 13
(13−2)	13−2 = 11

You could **change** this calculation by adding parentheses, like this:

```
PRINT10*2↑2/(4+3−2)
```

In this case, the VIC will first perform the exponentiation, then the multiplication . . . but before dividing, it will do the parenthetical operation. The calculation trail now looks like this:

10*2↑2/(4+3−2)	(4+3−2) = 5
10*2↑2/5	2↑2 = 4
(10*4)/5	10*4 = 40
40/5	40/5 = 8

Using Numbers in Programs

This part of our "magical" VIC tour is going to show you how to use numbers in your programs.

You can use numbers in your BASIC programs —not only directly, like you'd use numbers in counting or calculating—but also **indirectly** in the form of **variables** that can change as a number changes.

Our previous section gave you a quick introduction to calculation on the VIC. We mostly worked in the DIRECT MODE. Our next step is to explore how to use numbers in your BASIC PROGRAMS.

Let's begin with a short example.

```
10 INPUTX        (and hit RETURN)
20 PRINTX*10     (and hit RETURN)
30 GOTO10        (and hit RETURN)
```

Type RUN to start the program. Now type **any number** and hit RETURN. The VIC multiples your number by 10 and gives you the result. If you wanted to multiply your number by 10 percent, or by pi or by any other number, all you have to do is change the 10 in line 20 to something else. Also, the calculation in line 20 could also be division, addition, subtraction, or any other calculation.

The key to this program is the INPUT statement in line 10, which accepts the number *YOU* type in, and assigns it the value X. After it multiplies your number times 10 and PRINTs the result, the program loops back and asks for another number, which becomes the "new X."

To really understand how this program works . . . and in fact how most number-oriented programs work . . . you should understand **numeric variables.**

Numeric Variables

The concept of variables is explained in the VIC user manual, but this is one of the hardest computing concepts to grasp, so we're going to talk you through it gradually.

A variable is like a code. Numeric variables are like codes the VIC uses— and which you can use—to stand for a number. Numeric variables help the VIC remember and manipulate numbers—even change them—in a program. You can use variables for words, letters, phrases and graphics, too, but in this discussion we'll concentrate on those variables we use to represent numbers.

There are LEGAL and ILLEGAL variable names. Numeric variable names can be a single letter, two letters, or a letter and a number. Examples are: A, X, AA, AB, P1, R4, AB2, MU5. A special kind of numeric variable, which limits the value to an integer (whole number, no fractions or decimals) has a % sign as the last character (Examples: A%, AB%, P1%, R4%).

The other type of variable is called a "string variable." Here, numbers are used like words instead of **values** (e.g., a zip code or phone number). String variables end in a $ sign (Examples: A$, AB$) and are mostly used to specify letters, words, phrases, graphic symbols and descriptive numbers. If you tell the VIC that X=19406 then the VIC interprets the X as the **value** 19,406. But if you want that number to be descriptive, like a zip code, then you tell the VIC that X$=19406 and the number 19406 will be used like a word or phrase instead of a value.

How Variables Work

If I say X=10 then I have just created a **variable** and from now on the letter X stands for the number 10. You might ask why we don't just use the number 10 but in a moment we'll show you why using an X gives the VIC more calculating power and program flexibility.

If I tell the VIC X=10, then any time I use the variable X in my program, the VIC will think of it as the number 10. If I tell the VIC to PRINTX, the VIC PRINTs the number 10. Let's test this assumption. Type this:

```
NEW              (and hit RETURN—to erase
                   previous program)
X=10             (and hit RETURN)
```

We've told the VIC that the variable X equals 10. We can do this in DIRECT (IMMEDIATE) mode, without using line numbers. The VIC will automatically store these variables in its memory . . . although the variables may be changed or erased if we RUN a program. Let's continue. Type this:

```
PRINTX           (and hit RETURN)
```

The VIC responds by displaying the number 10. That's because we created the X variable

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by saying X=10. We can create other variables, too. Type this:

Y=2 (and hit RETURN)

Now we've defined TWO VARIABLES. X=10 and Y=2. The **power** of these variables is easily demonstrated. Type this:

PRINTX*Y (and hit RETURN)

The VIC multiplies the value of X (10) times the value of Y (2) and displays the answer, which is 20. In addition to direct calculation, you can design all sorts of calculator programs using numeric variables. Here's a short program that lets you enter two numbers to be multiplied and gives the answer:

10INPUTX:INPUTY:PRINTX*Y:GOTO10

Delay Loops Use Numeric Variables

We've discussed **time delay loops** in previous articles but how exactly does a "delay loop" work? It all has to do with numeric variables.

If you're programming a delay into your program, you may not know it but you're actually using a numeric variable. You see, you can specify that X equals a **range** of numbers—instead of a single number like 10. In a delay loop, you specify a variable like X as a range . . . the following example illustrates how:

```
10 PRINTCHR$(181);        (and hit RETURN)
20 FORX=1TO200:NEXT       (and hit RETURN)
30 GOTO10                 (and hit RETURN)
```

Type RUN and the screen slowly fills up with graphic bars. Want the bars to move faster? Hold down the RUN/STOP key and press RESTORE. Now type LIST and hit RETURN. In line 20, change the number 200 to 50 and RUN the program again. The speed with which the bars are printed picks up considerably.

The **reason** a delay loop works is because we have defined the variable X as a **range** of numbers from 1 to 200. We then told the VIC to start **counting** from 1 to 200 before going to the next line. When we change the number 200 to 50, we shorten the loop by redefining X as a range of numbers from 1 to 50. The VIC counts faster, and the program moves faster.

In other words, we have a **loop** which PRINTs a character (CHR$(181) is the same as "["), counts to 200, then goes back around to line 10 and prints the character again. The semicolon in line 10 makes the VIC display the next character immediately next to the previous one. If we didn't have the semicolon all the characters would appear in a vertical column.

Defining a variable as a **range** of numbers has other uses, too. Say we want to PRINT a title and four lines of blank spaces at the top of the screen. That makes 88 spaces, right? (4x22 columns) Our program should tell the VIC to:

1. Clear the screen

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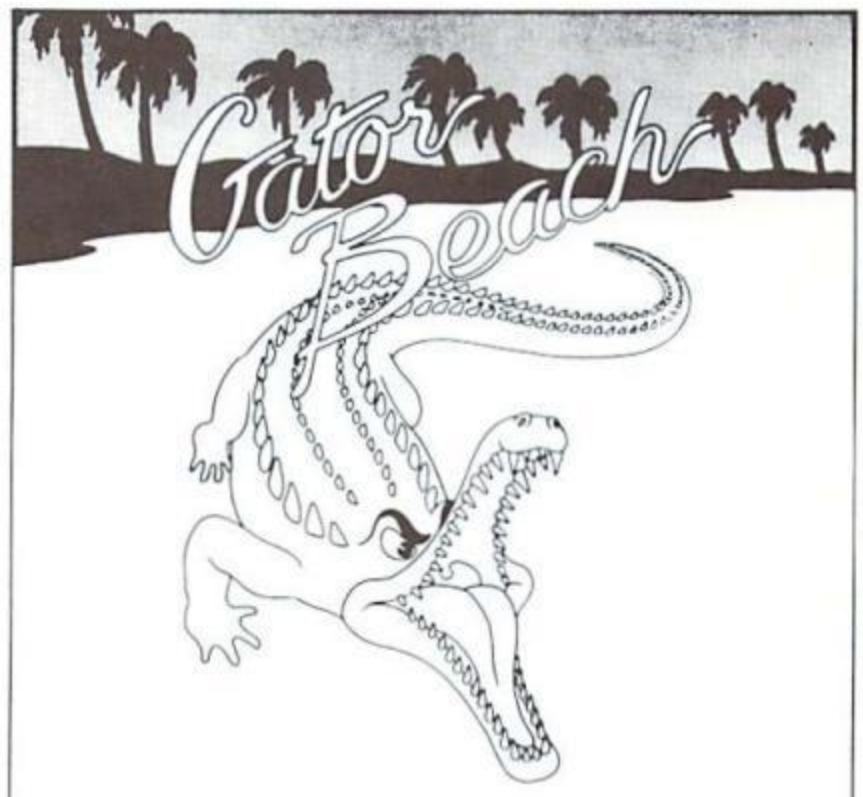

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2. PRINT a title at the top of the screen
3. PRINT 88 cyan spaces next to each other

Here's the program that does this:

```
10 PRINT"CYAN SPACES"
20 FORX=1TO88STEP1:PRINT"▶R";:NEXT
```

The first graphic symbol in line 20 means you've pushed CTRL/CYAN. The second symbol means you've pushed CTRL/RVS ON

The secret is the use of the loop in line 20. First we set up a number range of X=1 to 88. Then we STEP one at a time through that range. Each time we STEP we PRINT a cyan space. The semicolon says to print the spaces immediately next to each other. The NEXT tells the VIC to keep going through the loop until it hits the 88th time (end of the range we created for the variable X).

Here's a similar example using sound:

```
10 X=36876:V=36878:POKEV, 15
20 FORS=128TO254STEP1:POKE X,S:NEXT
```

Here we use two variables instead of one. X is our sound speaker, V is volume. The range of X is the range of tone values we want to use (see table of musical notes in owner's manual). We are STEPping 1 at a time to achieve a slower effect. What actually happens is that the VIC POKEs 36876,128 . . . then POKEs 36876,129 . . . then 36876,130 . . . and so on until we reach the upper limit of the range, which is 254. We could just as easily reverse the range and STEP-1 from 254 to 128.

To make this progression of musical notes into a sound effect, we just speed up how fast we STEP through the range of notes. Do this by LISTing the program and changing the STEP 1 in line 20 to STEP 10. Another alternative is to shorten the range of note values. In line 20, try keeping the STEP 1 but change the low value from 128 to 170. The higher value makes a higher sound. The shorter range means fewer notes and a faster effect.

Using X and X+1

One of the most frequent uses of numeric variables involves defining a variable at the beginning of the program, then **changing** the value of that variable later on. Often this takes the form of defining a variable like X, then adding 1 to that value to increase it (X=X+1).

The following counting program illustrates the use of a variable X and X+1, as explained in the comments below:

Program	Comments
10 X=1	Define X as the value 1.
20 PRINTX	Print the value of X, which is 1.
30 X=X+1	Increase the value of X by 1 (now 2).
40 GOTO20	Go back to PRINT the NEW VALUE OF X (2).

The counting program defines X as 1, PRINTS the starting value (1), then **changes** the value X by adding 1, and PRINTS the new value, then loops back each time to increase X by one, and PRINT the new value, etc.

If you want to see this program work more slowly, try adding a delay loop by changing line 40 to read: 40FORT=1TO100:NEXT:GOTO20

Delay loops like this can often be added anywhere in a program, by adding a colon and the FOR . . . NEXT loop.

Using the DEF FN Statement

In addition to its standard calculation abilities, the VIC also has a very special BASIC statement called "DEFINE FUNCTION," which lets you define a predetermined mathematical or scientific formula, and plug numbers into that formula during your program.

It helps to know something about variables before using the DEF FN, but this is not absolutely necessary. Pay close attention to the examples and experiment with a few of your own and you should catch on quickly to how this mathematical statement is used.

Let's begin with a simple example. Type NEW and hit RETURN to erase any old programs and type in this program:

Program	Explanation
10 DEFFNA(X)=.10*(X)	(RETURN) Sets up the formula.
20 INPUTX	(RETURN) Sets up your number input.
30 PRINTFNA(X)	(RETURN) Prints the formula answer.
40 GOTO10	(RETURN) Goes back to repeat line 10.

Type RUN and hit RETURN to start. (Hold down RUN/STOP and RESTORE to exit the program). This program calculates 10 percent of any number you type. When the question mark appears, type a number and hit RETURN. The VIC calculates 10 percent of that number and displays the answer.

Setting up a DEF FN Statement

Let's use our example to show you how the DEF FN statement works. To begin with, the format is always similar:

```
DEFFNA(X)=(formula)(X)
```

The DEFFN part of the line is simply the DEFine FuNction statement.

The A following the DEFFN statement is a **variable.** It means that this function has been defined (by you) as Function A. It might be helpful to think of this as the name of the particular formula you are using. The **name** you give to the formula must always be included where the **A** is shown. Most programmers save memory by using ONE-LETTER VARIABLES, but the function name can be any legal numeric variable name, up to **FIVE CHARACTERS LONG.** The name must start with a letter but can also include numbers. Here are some function name examples:

Legal DEFFN Names:		Illegal DEFFN Names:
DEFFNP10	DEFFNWAR2	DEFFN1 (number)
DEFFNAB	DEFFNGAME	DEFFN82M(starts w. number)
DEFFNABCD	DEFFNR2D2	DEFFNABCDEF (too long)

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The DEFFNA is the name of the DEFINE FUNCTION statement. The variable in the parentheses (X) is the NUMBER we are going to manipulate or include in our calculation. DEFFNA(X) simply means we are defining a function called A which is going to manipulate a number called X. Using an X is just a formality. Even if we use X here, later on you can put ANY NUMERIC VARIABLE in the formula by referencing FNA(B2), FNA(B+C+D), FNA (XY) or any other variables in your program. (see ADDING MACHINE with ROUNDING, BELOW). You aren't limited to using the X variable. In other words if you use X or Y or B2 or whatever in your DEFFN formula setup, you can plug other variables in the formula by using FNA (your other variable here), because the A in the FNA activates the formula.

The next part of our DEFFN example is the **equal sign.** This means we are setting FUNCTION A equal to a formula we are going to type on the RIGHT SIDE OF THE EQUAL SIGN. This formula will control what the function actually does.

The right side of the equal sign consists of two parts . . . the **formula or calculation** we want to perform, and the **place** where a number can be inserted. The number is represented by the variable X in our first example and sample format, but it can be any **legal numeric variable name** (a letter, 2 letters, a letter and a number or 2 letters and a number). Where we put our number in the formula (where we put our X) is important because this number will be the KEY to our calculation. In the first example—our 10 percent solution—we made the formula very simple. We multiplied X times 10 percent. Now, every time the VIC encounters an X we can tell it to multiply it times 10 percent simply by including FNA(X) in our program.

Celsius to Farenheit Using DEF FN

Here's an example of a DEF FN formula which converts Farenheit into Celsius . . . we'll call the function C (for Celsius) and call the Farenheit number in the formula F. The function itself looks like this:

```
DEFFNC(F)=5*(F-32)/9
```

Celsius temperature equals 5 times the (Farenheit temperature minus 32 degrees) divided by 9. We've set up a function statement which does just that. Now all we have to add to our program is a means for us to ENTER the Farenheit number. This is very similar to our 10-percent program above:

```
10 DEFFNC(F)=5*(F-32)/9
20 PRINT"ENTER FARENHEIT":INPUTF
30 PRINT"FARENHEIT"F"IS"FNC(F)
        "DEGREES CELSIUS"
```

The structure is simple. First we set up our formula, a straightforward temperature conversion. We call our statement C. The number we want to convert is F for Farenheit.

Next, we PRINT a message telling the user to type an input.

The INPUT F tells the VIC to display a question mark and wait for the use to type (input) a number. As soon as the user types a number, it is automatically given the variable code name "F" (see previous section).

Finally, we PRINT a message which includes the calculation answer. We do this by PRINTing a verbal message INSIDE the quotation marks, then we PRINT the value of F (the number the user typed in from the keyboard) OUTSIDE the quotation marks. Next, we go INSIDE quotes again to type the word "IS", then back OUTSIDE to print the VALUE of FNC(F)—which means the value of F after plugging it into our temperature conversion function statement C in line 10. That value is PRINTed and we're back INSIDE quotes again for the remainder of the message (DEGREES CELSIUS).

You can dress up this program considerably by adding color (after any quotation mark, hold down the CTRL key and hit one of the keys with a color on the front), or REVERSE (inside quotes just like color except press CTRL and RVS ON, then CTRL and RVS OFF to get back to normal).

Here's a SOUND EFFECT you can add to this program. Just type in this line and hit RETURN, then type RUN:

```
25 POKE 36878,15:FORS=200TO125STEP-1:
    POKE36876,S:NEXT
```

This line sets the volume control at 15 (highest), then creates a loop with a musical note range from 200 to 125 and steps down one at a time when the program hits POKE36876,S:NEXT. You should recall from the VIC owner's guide that 36876 is one of the VIC's speaker numbers.

A DEF FN Rounding Program

Here's a program that demonstrates the DEF FN statement, and also provides a "rounding" program. To use it, you have to use a variable (in this case X) to stand for your number. Then, whenever your number, or any number designated X, is generated, it can be **rounded** to the nearest 10th, 100th, 1000th or whatever simply by changing the value of P in line 20. Change P to 10 to round in 10ths for example. Here is the sample program:

```
10 DEFFNA(X)=INT(X*P+.5)/P
20 P=100
30 PRINT"ENTER A NUMBER":INPUTX
40 PRINT"YOUR NUMBER ROUNDED TO THE
    NEAREST"P"TH IS"FNA(X)
50 GOTO10
```

A Simple Adding Machine

Here's a simple program using the INPUT statement to create a simple adding machine:

```
 5REM ADDING MACHINE
10INPUTA:PRINTC+A
20INPUTB:PRINTC+A+B
```


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```
30C=A+B+C
40A=0:B=0
50GOTO10
```

Here's how this program works . . . first we INPUT a number which we call A. Then we PRINT the value of C and A, which on the first round does nothing (because C is not yet assigned a value) and only the A number is PRINTed.

In line 20 we INPUT the value of the second number, which we call B. Then we PRINT the sum of A+B (our adding machine) but again no value is assigned to C yet so the C is ignored and we get the sum of the first two numbers.

In line 30 we create a new variable C and define C as the sum of A and B. In other words, C now becomes the value of the first two numbers added together.

In line 40 we reset A to zero and B to zero. This is called "clearing our variables" and means here that we put A and B back to zero so we could type in NEW VALUES for both of these numbers. The sum of the two numbers we already typed in is preserved in our new variable C.

Now in line 50 we go back to line 10 and repeat the program, except NOW the C variable has a value (the sum of the first two numbers we typed in). So when we type in a new number called A (INPUT A), the VIC PRINTs the sum of A (the new number) and C (which we define as the sum of our first two numbers). The result is the added sum of the first three numbers entered.

In line 20 we enter the next number (INPUT B) which we add to our new number (A) and our old sum (C). The total is PRINTed.

Line 30 redefines C. This time, C becomes the total of the old sum (C), our new number A, and our new number B. Now we can set A and B back to zero and start over again.

More specifically . . . if we were adding 10 every time, we would start by adding 10 (A) to 10 (B) which then becomes 20 (A+B). C is then defined as 20 and A and B are set back to zero. Then the program repeats to add a new number 10 (new A) to 20 (C) to get 30 . . . then adds 10 (new B) to 30 (C) to get 40, then redefine C as 40, or 10 (new A) + 10 (new B) + 20 (old C).

Adding Machine With Rounding Function

If we want to add decimal point numbers and ROUND them off, we can do so by incorporating the ROUNDING function described previously. Here's how we would add the rounding function to our ADDING MACHINE program to round off all numbers to the nearest 100th (2 decimal places rounded up or down):

```
 5REM ADDING MACHINE WITH ROUNDING
10DEFFNR(A)=INT(A*100+.5)/100
20INPUTA:PRINTFNR(C+A)
30INPUTB:PRINTFNR(C+A+B)
40C=A+B+C
50A=0:B=0
60GOTO20
```

This rounding program takes our A, B and C variables and plugs them into the DEFFN rounding formula we described earlier. Now ANY value put in the parentheses after DEFFNR( ) will automatically be rounded and plugged into the formula, because it's the DEFFNR that determines what is done to the information in the parentheses, and after the FIRST definition of the function (line 10) any time we want to plug a variable into the formula, we can do so by typing DEFFNR followed by the variable we want to manipulate in parentheses.

In the program above, notice that we only had to type an A in parentheses in line 10. Later, when we type in line 20: FNR(C+A) the program automatically inserts the C+A variables where the A was in line 10. The C+A variables could have been any other numeric variables we might use in our program—M, R, XX, S2, etc.

Scientific Notation, Binary Decimal & Other Peculiarities

Because the VIC calculates using the binary number system, and translates it into our normal decimal numbering system, a few peculiarities may arise . . . for example, if you type: PRINT.34−.30 you will get an answer that looks like this: .0400000001

Clearly, the extra decimal places and the last 1 do not belong in our answer, which should be .04. The difference is so minimal that it doesn't affect most calculations. The best way to avoid this discrepancy is to use the rounding routines discussed earlier.

Another mathematical quirk is if you type: PRINT .5555555556 The VIC will PRINT .555555555 and lose the 6. The VIC rounds DOWN automatically at six or less digits, and rounds UP if there are seven or more digits. This results from the way computers store floating point numbers.

Another idiosyncrasy of the VIC is its use of **scientific notation** when an answer or calculation exceeds a certain limit. This special notation allows the VIC to display large numbers using fewer digits, and is used by many computers. Scientific notation takes the form:

numberE+ee

Here are some examples:

Standard	Scientific Notation
20	= 2E+1
10500	= 10.5E+3
6600	= 66E+2
.66	= 66E−2
.0000000001	= 1E−10

Summary

If you are planning to use your VIC for calculations, these notes to supplement your user's manual should help. The *VIC 20 Programmer's Reference Guide* provides additional information, and most BASIC programming manuals for the PET/CBM or VIC will give you more insights.

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CATTLE-ROUNDUP — The cows are loose in the maze. You have 2 minutes to get each cow back into the corral. You can push, coax and call the cows. Some cows are not very smart and some are very stubborn. You will have to help them. Be careful that you don't leave the corral gate open. Color graphics and sound. Eight levels of play and a time limit. $12.95

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SNAKEOUT — Blocks appear on the screen at random. You move up, down, right and left and try to move your snake over the blocks. Each block that you get raises your score. Keep building your score but watch out because the escape routes keep getting smaller. Time limit, color graphics and sound. 3 games on this cassette. Snakeout — 2 player Snakeout and Trapper. 9 Levels of Play. $12.95

TARGET COMMAND — Move your laser into position and get ready for some quick action. Different types of missiles are dropping. How many can you shoot down. They all travel at different speeds and different levels. You must be fast on the trigger to get them all. Time limit, bonus points and very addicting. Color graphics and sound. Arcade style fun. 10 levels. $12.95

BOMB'S AWAY — Can you stop him? The crazy bomber drops the bombs from the top of the screen. You get 3 buckets to catch them. Before you know it bombs are falling so fast you wonder when he will stop. Just when you think you have him under control your bucket gets smaller. Is your hand quicker than your eye? $12.95

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BUG BLAST — Now its your turn to get even. Bug blast makes it easy. Blast thru the cactus and wipe them out. But watch out for the higher levels. Just when you think everything is under control the attackers seem to be everywhere. Will they ever stop. Now you can get even — if you dare. If you like Centipede you are gonna love BUG BLAST. $12.95

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VIC 20 Fulfills Young Heart Transplant's Wish

by John O'Brien

David Mendoza is not your average 14 year-old. He has already been the subject of newspaper articles, TV news stories and even a half-hour documentary. On July 15, 1981, David became the youngest person in Arizona to receive a heart transplant.

David was born with a heart that had two chambers instead of four. When he was five he underwent open heart surgery that allowed him to live normally for seven years. When his health began faltering in 1981, he was admitted to a hospital with heart failure. Doctors didn't think he could live much longer without a heart transplant.

Now, after the successful surgery and several months of recuperation, David is back home in Scottsdale, Arizona, with his mother, Pat, his father, Eddie, and brother, Monte. Like many youngsters his age, he enjoys racquetball and swimming—and has a giant poster of Loni Anderson on the wall of his room.

And, like millions of other 14 year-olds, David also has a strong interest in personal computers. In fact, he was so anxious to get onto a computer that he was renting computer time at a local computer store, in addition to working on the computers at the Supai Middle School. One of his goals for this past summer was to try to get a job so he could save enough money to buy one of his own.

David's wish for a computer was mentioned in a newspaper article that came to the attention of some people at Commodore, who wanted to help. So last June I had the honor and pleasure of presenting David with a VIC 20, a datassette and enough software to get him started.

David took to the computer like a fish takes to water. He even seemed to master Blue Meanies from Outer Space easily. He said he was glad the VIC uses a BASIC similar to PET BASIC, because one of the computers he had worked on at school was a PET.

At last report, David was up to Unit 7 in Commodore's "Introduction to BASIC" package. It's no surprise that David likes the teach-yourself-programming package, because he is considering a programming career. He said he has written an animation program, but, in his estimation it was "no big deal". He is now looking for a place to get some computer programming instruction during summer vacations.

Obviously David still has some restrictions due to his heart problem. He must be very careful of his worst enemy, infection, and must take close to 30 pills every day. He maintains a special diet and keeps daily records with his portable electrocardiograph.

David has overcome tremendous odds just to be alive, yet he has also managed to be an excellent student. In fact, he was named outstanding student for the month of February—which earned him a trip to Disneyland—and, at his graduation in May, he had a poem published in the graduation program, which he also read at the ceremony. At his point, with youth on his side, it looks like nothing can stop him.

VIC Fix

Clue to Saving VICFLIP-IV

If you're wondering about the "repeated" line numbers in the VICFLIP-IV program listing we ran in the premier issue, wonder no more. Line numbers are not repeated. There are actually two separate programs. The first one contains the instructions, and the second one is the game itself. Type down to line 165 and save. Then start the next section immediately after (it begins with line 21 on page 33) and save that part separately under a different name. Line 2 in the first section connects the two, so the second part will load automatically after the first part runs. Thanks to Joshua Glazer of Philadelphia and others for pointing out that possible source of confusion.

Don't Confuse "Greater Than" with Parenthesis

When you're typing a program listing from a VIC printout be careful not to confuse the "greater than" and "less than" symbols with opening and closing parentheses. They look a lot alike. The parentheses are just slightly more rounded. Thanks to Jack Kotz of Levittown, Pennsylvania and others who fixed their programs by applying a little eyestrain.

Symbol Error

On page 12 of the premier issue we made an error in printing the graphic symbols that represent the various cursor keys. The symbols representing "CURSOR UP" and "CURSOR DOWN" are reversed. Thanks to Joseph O'Brien of Willingboro, New Jersey for drawing that to our attention.

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CONGRATULATIONS TO COMMODORE CHALLENGE CONTEST WINNER:

Mark Biggs
age 17 of Morrilton, Arkansas
for "VIC Baseball"

We received a slew of superb software from our talented readers over these past few months, but, unfortunately, could choose only one winner. Many thanks to all of you who submitted programs. They were all terrific! And keep up the good work. Who knows... maybe next time the winner will be YOU! Meanwhile, look for Mark's program listing in the December issue of POWER/PLAY. You'll enjoy playing VIC Baseball!

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Programs requiring memory expansion are eligible, too, but will not be published unless space allows.

Each issue, we'll award prizes to two entries. First place winners will receive a VIC 20 8K Memory Expander Cartridge. Second place winners will receive a VIC 3K Memory Expander. All entries become the property of Commodore Business Machines, Inc., upon submission. Winning entries published by POWER/PLAY will become public domain software.

Fill out the entry form below, and submit it with your game or program to:

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by David Malmberg 43064 Via Moraga Fremont, California 94539

THE TURTLES

The Turtles are coming! The Turtles are coming! This is not a Paul Revere-like call to arms, or an announcement of an impending invasion of pesky creatures like killer bees. Instead, "the Turtles are coming" refers to a revolution that is quietly taking place in the way computers and programming concepts are being introduced and taught to children and other first-time programmers through the use of Turtle graphics.

Turtling or Turtle Talk, as it is sometimes called, is a simple and fun way for the beginning programmer to gain mastery over the computer in just a few minutes. By giving an imaginary Turtle directions on how to roam over the computer's display screen, the programmer can create colorful and artistic pictures. As the novice programmer becomes more and more adept at teaching his Turtle to paint using Commodore's great graphics (and, in the case of the VIC, rich color palette), he is learning all of the basics of computer programming himself. Turtling is an innovative way to learn that not only develops computer awareness, but enriches a child's math, logic, communication and artistic skills as well.

The ideas behind Turtle graphics were pioneered by Seymour Papert and others at MIT's Artificial Intelligence Laboratory during more than a decade of research into how children should learn with and about computers. After spending a great deal of time working with the famous child psychologist, Jean Piaget, studying how children think and learn, Papert concluded that most efforts at Computer Aided Instruction (CAI) missed the mark by 180 degrees. Traditional CAI methods tended to **program** the student to respond with a set of correct answers. By comparison, the "Piagetian" view of learning calls for a more unstructured environment where the child is given the tools needed to solve problems, and is then asked to work out the solutions for himself.

Inherent in this approach to learning is the idea that there is no longer only one right answer that the student either gets or does not get correct when asked. Rather, problem solving, like computer programming, is a gradual process that you almost never get right the first time. Learning becomes a process of successive "debugging" of your previous attempts to solve the problem.

The primary learning tool that Papert armed his children with was a Turtle that the children could teach to solve problems by giving it simple instructions (in the form of computer programs). Papert's earliest version of this learning tool was a mechanical robot that could be programmed to move about the floor. The robot moved so slowly that it soon gained the nickname "Turtle". The name stuck; and even though the technology has evolved to a cursor moving on the surface of the computer video display unit and a full-featured computer language named LOGO, the basic learning concepts are still referred to as Turtle graphics.

The results from using the Turtle as a learning and problem-solving tool can be dramatic. According to Papert: "Even the simplest Turtle work can open new opportunities for sharpening one's thinking about thinking. Programming the Turtle starts by making one reflect on how one does oneself what one would like the Turtle to do. Thus teaching the Turtle to act or to 'think' can lead one to reflect on one's own actions and thinking. And as children move on, they program the computer to make more complex decisions and find themselves engaged in reflecting on more complex aspects of their own thinking."

As a result, even children with severe cases of what Papert calls "mathophobia" can learn programming and problem-solving skills through the process of teaching their Turtles these same skills—and have fun at the same time!

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ARE COM NG!

```
146 PRINT"
147 PRINT"      <↑ K>
148 PRINT"      M
149 PRINT"      ↓
151 PRINT"  THESE KEYS W
152 PRINT"  WHEN THE CUR
154 PRINT"
```


(continued on page 28)

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TURTLES *(continued from page 27)*

Turtle concepts are simple to learn and easy to use. For example, in VIC TURTLE GRAPHICS (a language developed by the author but patterned after Papert's LOGO) the following routine can be used to direct the Turtle to draw a square on the screen.

```
LABEL SQUARE
PEN DOWN
LOOP 4
FORWARD X
TURN RIGHT
LOOP END
PEN UP
ROUTINE END
```

The LABEL SQUARE command allows this group of commands to be referred to by a single name—SQUARE. PEN DOWN causes the Turtle to leave a trail behind it when it moves. This trail is the way the Turtle draws on the screen. If the PEN is UP, the Turtle will move without leaving a trail. LOOP 4 causes all of the commands until LOOP END to be repeated four times.

When these commands are repeated, they cause the Turtle to move FORWARD a distance of X spaces (leaving a trail character behind at each space), then TURN RIGHT and move FORWARD X spaces again, TURN again—repeating until the square is finally done. Then the PEN is set to UP. ROUTINE END signals that this is the end of the SQUARE routine.

To use this routine to draw a square made of five red asterisks on a side, the following VIC TURTLE instructions could be used:

```
CALCULATE X=5
TURTLE COLOR RED
CHARACTER TO •
USE SQUARE
```

The CALCULATE X=5 tells the Turtle that whenever it sees a variable X to remember that it equals the number 5. In VIC TURTLE GRAPHICS, CALCULATE equations may be as complex as the programmer wants or needs, and may use any of the VIC's built-in BASIC functions, such as RND, SIN, TAN, etc. TURTLE COLOR RED causes the Turtle trail character to be red, and CHARACTER TO • causes it to be an asterisk. USE SQUARE causes the Turtle to follow the directions given in the routine SQUARE.

VIC TURTLE GRAPHICS has almost forty different commands, including those for screen and border colors, sound, motion (speed and direction), logical conditions, program branching, (sub)routines, and testing for the presence of a particular character in front of the Turtle on the screen. Using these commands, the beginning programmer can solve problems as simple as printing his name on the screen, or as challenging as drawing a maze and then programming his Turtle to find its way out.

In the process of teaching his Turtle to solve these problems, the child will have established a solid foundation in programming and computer concepts that will make moving on to BASIC and/or other more mathematically oriented languages surprisingly easy. In addition, the thinking and problem-solving skills of both the Turtle and its programmer should be greatly enhanced.

There are a number of very worthwhile resources available for those who wish to learn more about Turtling and its various applications in teaching programming and problem solving to children. Some of the best are:

1. **MINDSTORMS: Children, Computers, and Powerful Ideas** by Seymour Papert (Basic Books, 1980)—Clearly **the** classic work on using TURTLE languages to teach children computer concepts. ($12.95)

2. **WSFN** (Which Stands For Nothing) by Lichen Wang and Larry Tesler—An early TURTLE language for the Commodore PET. Does not have all of the capabilities of VIC TURTLE GRAPHICS or KIDSTUFF, but still has many good ideas, and is a fun teaching and learning tool. Can be obtained on a tape (with 3 other programs and associated documentation) from:

   Computer Project
   Peninsula School
   Peninsula Way
   Menlo Park, CA 94025
   Price for all 4 programs—$14.95

3. **KIDSTUFF** by Thomas R. Smith—A more recent, and more advanced TURTLE language (than WSFN) for the PET/CBM computer by an educator who has worked out the "bugs" where it counts—with kids in the classroom. Many excellent examples, and a very easy-to-follow tutorial style of documentation. Can be obtained on tape with a 45 page instruction manual for $59.95 from:

   Thomas R. Smith
   P.O. Box 345
   Dedham, MA 02026

4. **FRIENDS OF THE TURTLE** by David Thornburg—A monthly column in COMPUTE! magazine that specializes in explaining computing through TURTLE concepts. Highly recommended.

5. **VIC TURTLE GRAPHICS** by David Malmberg—A simple, but powerful, TURTLE language for the VIC on a plug-in cartridge. Comes with a manual written in two parts for two audiences: (1) a series of graduated lessons filled with examples for the beginning programmer, and (2) a reference manual for the more experienced programmer (or instructor—if used in a classroom environment). Can be obtained for $39.95 from:

   Human Engineered Software
   71 Park Lane
   Brisbane, CA 94005

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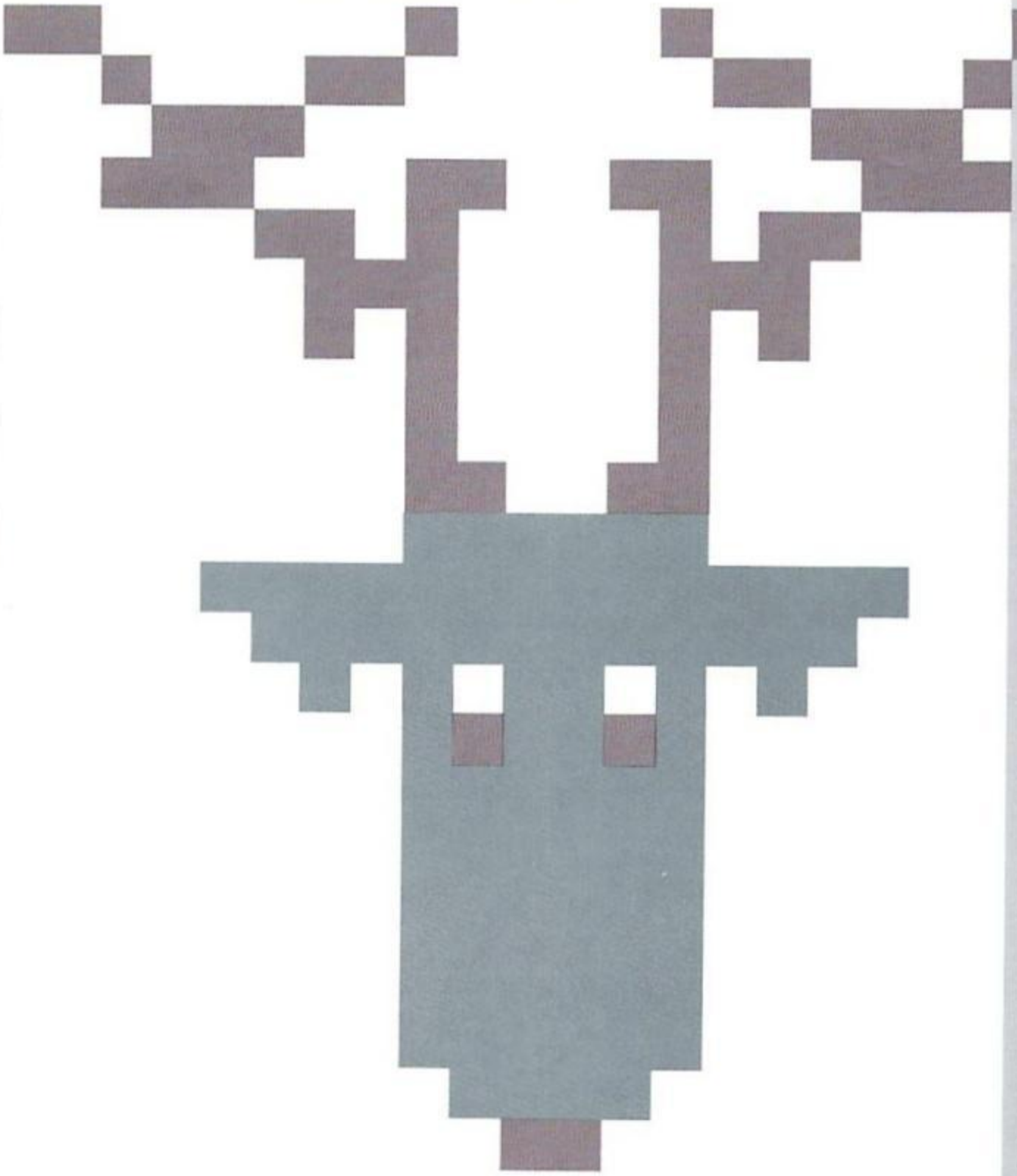
The VIC 20 Electronic Christmas Card

If you plan to give someone a VIC 20 this Christmas, this is a terrific little program you can include along with it. It plays "We Wish You a Merry Christmas" and displays the words to the song, while the screen changes into various red-green combinations.
Courtesy of Dr. Bruce Downing.



If you'd like to have your VIC play "Happy Birthday," complete with a cake and candles, contact:

Daniel Pohoryles
2328 Southgate Square
Reston, VA 22091

Dan sells a Happy Birthday cassette for $3.95.

```
10 S2=36876
20 V=36878
30 PRINT"■■■■■■■■■■■■"
32 POKE 36879,90
34 PRINT "■■■■MERRY CHRISTMAS"
100 POKE V,10
101 GOTO 183
    102 FOR I=1 TO 8
    110 READ P
    130 IF P=-1 THEN 200
140 READ D
150 POKE S2,P
160 FOR N=1 TO D:NEXT N
170 POKE S2,0
180 FOR N=1 TO 20:NEXT N
181 NEXT I
182 RETURN
183 GOSUB 102
184 GOSUB 240
190 GOSUB 102
192 GOSUB 260
194 GOSUB 102
196 GOSUB 268
198 GOSUB 102
200 POKE S2,0
220 FOR I=1 TO 1000:NEXT I
221 RESTORE
222 GOTO 10
240 PRINT "■■■■■■■■■■■■"
245 POKE 36879,45
250 PRINT "■■■■MERRY CHRISTMAS"
252 RETURN
260 POKE 36879,90
262 PRINT "■■■■■■■■■■■■"
264 PRINT "■■■■ERRY CHRISTMAS"
266 RETURN
268 POKE 36879,42
270 PRINT "■■■■■■■■■■■■"
272 PRINT "■■■■AND HAPPY NEW YEAR"
274 RETURN
320 DATA 228,250,235
330 DATA 250,235,125
340 DATA 237,125,235
350 DATA 125,234,125
360 DATA 231,250,231
370 DATA 250,231,250
380 DATA 237,250,237
390 DATA 125,239,125
400 DATA 237,125,235
405 DATA 125,234,250
410 DATA 228,250,228
415 DATA 250,239,250
420 DATA 239,125,240
425 DATA 125,239,125
430 DATA 237,125,235
435 DATA 250,231,250
440 DATA 231,125,231
445 DATA 125,228,250
450 DATA 235,250,234
455 DATA 250,235,250
460 DATA -1

READY.
```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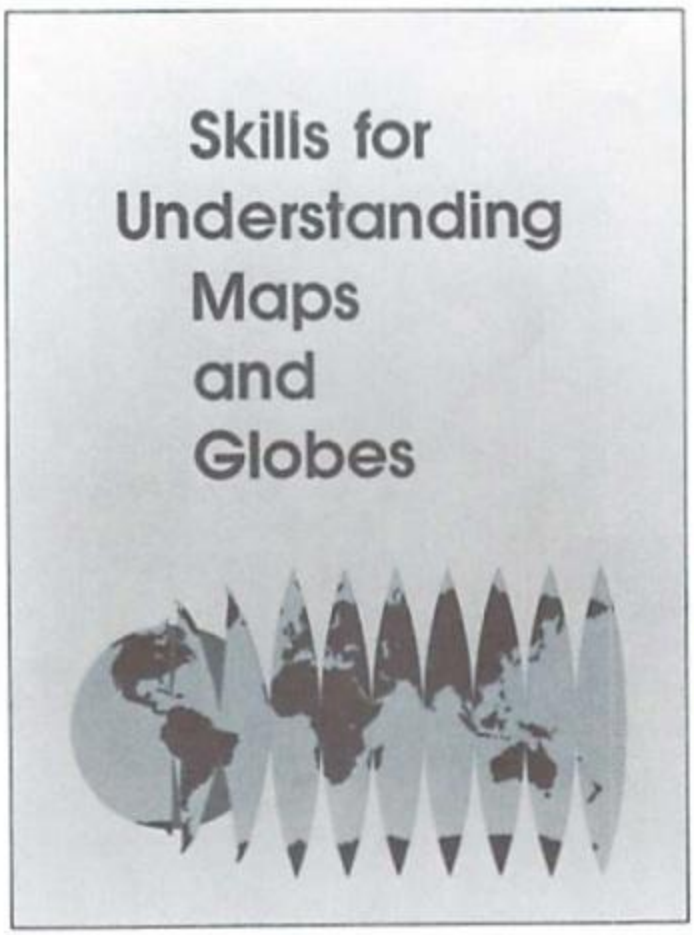
No More Pencils, No More Books...

"Maps And Globes" Helps Students Understand Their World

With its 96-page booklet and somewhat staid (if colorful) question-answer format, Maps and Globes from Micro-Ed is a tad classroom-ish. At $136.00, the nineteen-lesson educational package is also a bit of an investment for the home user. But for those who want to develop an understanding of maps and globes—not just how to read them, but how they've evolved through history, what they mean and how they're used—the series provides solid insights in a clear, easy-to-use format meant for users from the elementary level on up.

The computer programs are used directly with the booklet, *Skills for Understanding Maps and Globes*, by Kenneth Job and Lois Wolf (Follett Publishing Company). The student first reads a chapter in the booklet, then brings the book to the computer, loads the corresponding program and begins the lesson. The computer poses questions concerning the subject matter (usually about 15 questions per chapter) and, of course, provides immediate feedback on the student's responses.

The feedback is fun, when you get the correct answer—the computer goes briefly berserk with screen-color changes to dazzle and delight. A wrong answer, however, merely provokes a curt "wrong". Then you get to try again—and again, and again, if necessary. If you get stuck, simply type a "?" and the computer shows you the right answer. Then you get to type it in and set off the jubilant color changes. At the end of the lesson, the computer provides a summary of how you did—the number of right and wrong answers, and the time it took you to complete the questions. For the VIC 20 on tape or disk from Micro-Ed, P.O. Box 24156, Minneapolis, MN 55424.



Part of the Maps & Globes package is a 96- page book.

New Low-cost Educational Software for the VIC 20

M-R Information Systems announces a series of low-cost educational software for the VIC 20. Newly available packages are:

MicRo Quiz II: Subject Independent CAI authoring package with class evaluation features. Requires no computer programming knowledge. Requires 3K expansion. $39.95

MicRo Spell: A comprehensive graded spelling drill package. Includes words most frequently misspelled by students grades 3-7. Requires 3K expansion. $24.95

MicRo Hangman: The traditional word guessing game. Combines entertainment with spelling drill. $9.95

The computer asks questions about what you've read in the accompanying book.

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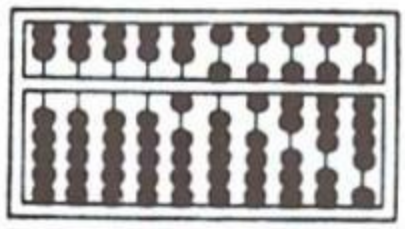

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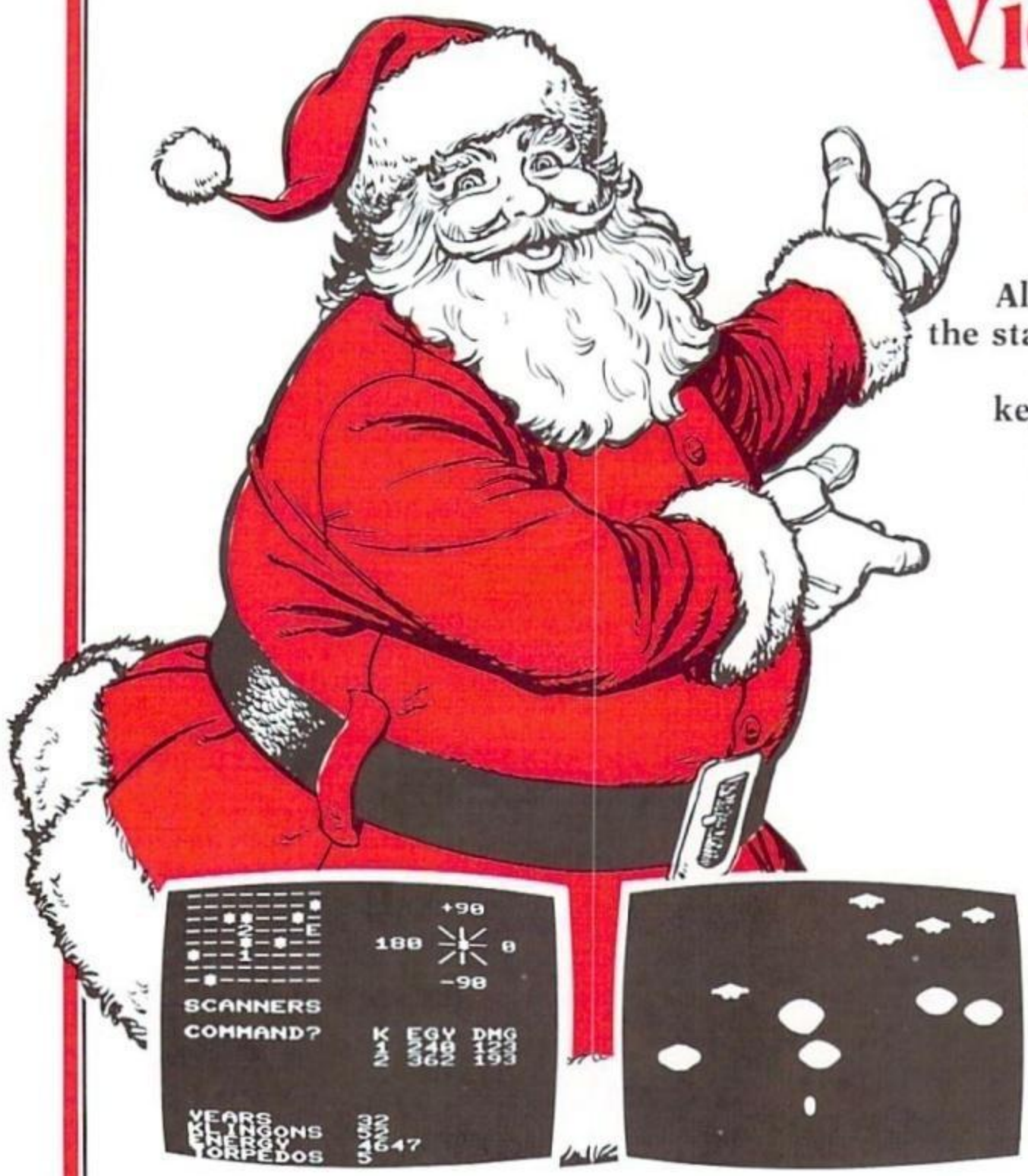
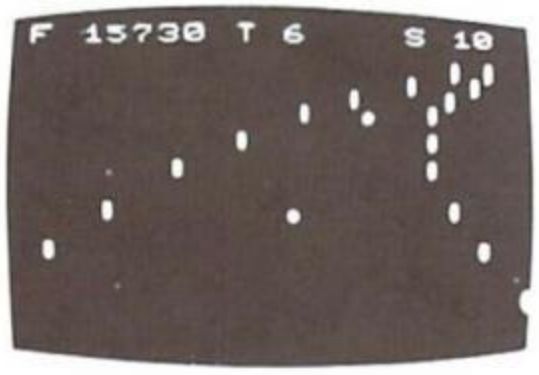
Available now from stock. All these new programs fit in the standard VIC-20 memory and can be controlled from the keyboard. Where appropriate from a joystick as well. All programs on cassette tape.





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I still can't believe we packed full featured adventures into the VIC's 3.6K memory! Adventures are interactive fantasy games in which you solve a mystery by exploring an unknown environment with the assistance of your computer. You tell the computer what to do with plain english commands like "OPEN THE DOOR", and the computer tells you what it sees! Average solving time for our adventures is six hours.

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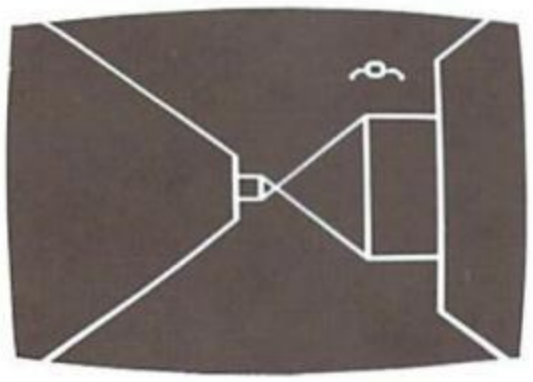

TREASURES OF THE BAT CAVE **$14.95**

Battle the vampire bats as you search their cave for gold bullion. Fast, real time action will keep you playing for hours. Of course, you are in a different cave every time you play (the action takes place against the realistic 3-D display of the MAZE program).

MAZE **$12.95**

Don't buy this program if you suffer from claustrophobia! You try to find your way out of a maze on foot. The display gives an incredible 3-dimensional view. Machine code subroutines allow you to move as quickly as you can push buttons. You may view the maze from the top if you get hopelessly lost.

Plus, there are over $6X10^{23}$ different mazes that the program can generate. There is little chance that you'll see the same maze twice! There are nine levels of difficulty included.

GAMES PACK I
(3 programs) **$14.95**

Cage—You are trapped inside a dungeon with iron spikes slowly descending upon you. Stay alive as long as you can by shooting off the ends of the spikes with your gun. Six different versions make for hours of fun.

Atomic Charger—Keep the atom moving in its atomic chamber by shooting it with your electron gun.

Suicide Squad—Use your fireman's net to bounce the suicidal maniacs into the waiting ambulance as they leap out of a tall building.

VICTORY CASINO **$9.95**

Enter the pleasure palace and try your luck at dice, numbers, and bluffing. Match your wits against 3 unique games of chance.

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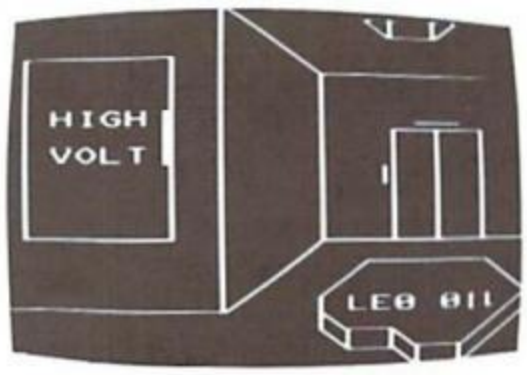
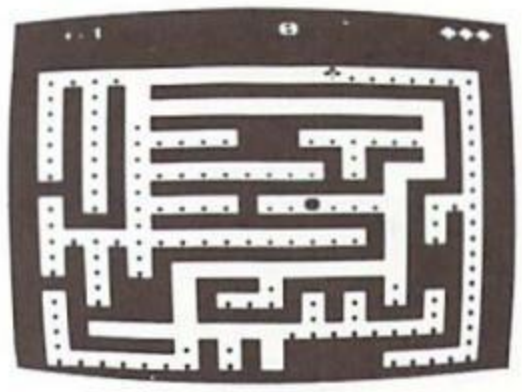
Does your child know Arkansas from Alabama? Boston from Boise? He can test his skills with questions on states and their capitals.



GRAVE ROBBERS **$13.95**

Introducing the first GRAPHIC ADVENTURE ever available on the VIC-20! With realistic audio-visual effects, you explore an old deserted graveyard and actually see the perils that lie beyond.



STREET SWEEPERS **$14.95**

Gobble up all of the dots in the maze before the ensuing nemesis gets you. The maze is different every time, and if you succeed in getting all the dots, you get progressively harder mazes to complete as your skills increase. Does this sound like Pac Man? It isn't! Highly recommended and extremely addicting.

MANCALA **$8.95**

Mancala survived over 3000 years from ancient Egypt so that you could play it on your computer! The computer plays masterfully on its hard level, competently on the easy level for learning purposes. If you enjoy chess or awari, you might just give them up for MANCALA. Easy to learn, difficult to master.

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Print Out Personalized Biorhythm Charts

Use your VIC graphic printer and 3K memory expander to get a printout of your biorhythm chart personalized with your name. First, get Commodore's Biorhythm Compatibility tape, available as part of our Recreational Six-pack.

Plug in your 3K memory expander (an 8K will not work well for reasons explained in our "POKEing Around" story on page 54), list the biorhythm program on your screen and make the following changes.

Change line 185 to read:

```
185 PRINT"■■■F1■  /EW CHART":PRINT"■■F2■
  ■RINT":PRINT"■■F7■  ■LOT NEXT 20 DAYS"
```

Change line 200 to read:

```
200 POKE36879,27:PRINT"■"
```

Add line 201:

```
201 INPUT"■YOUR NAME";Z$
```

Add line 205:

```
205 PRINT"■■PLOT FROM":PRINT"<MO/DA/YR>■■
■";:GOSUB1000:IFI1=0THEN200
```

Change line 655 to read:

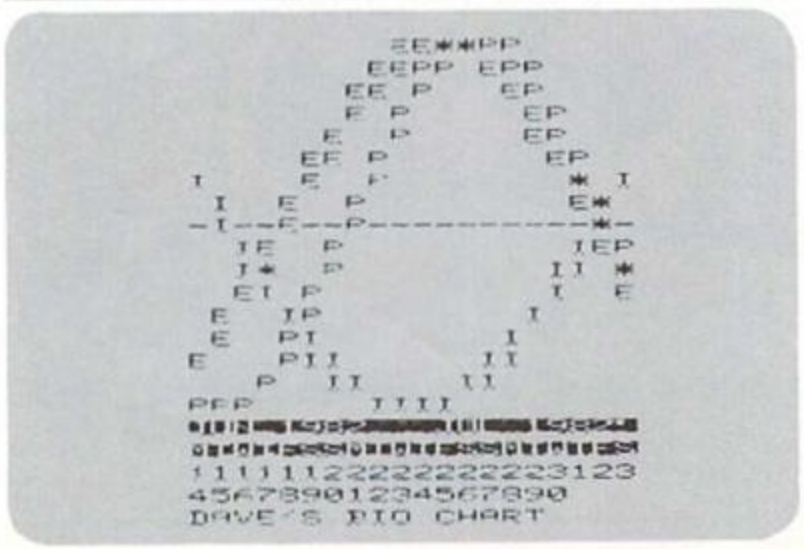
```
655 PRINTF$"■"Z$"'S BIO CHART";
```

Add line 751:

```
751 IF I=137 THEN GOSUB60000
```

And, finally, add these 15 lines:

```
60000 REM CRT COPY
60010 G1$=CHR$(145)
60020 OPEN4,4:PRINT#4,CHR$(14):G1=7658
60030 FORG0=0TO22:G0$=G1$:G1=G1+22
60040 FORG2=G1TOG1+21:G3=PEEK(G2)
60050 IFG3>128THENG3=G3-128:G4=1:G0$=G0$
+CHR$(18)
60060 IF(G3>0)*(G3<32)THENG3=G3+64:GOTO6
0100
60070 IF(G3>31)*(G3<64)THEN60100
60080 IF(G3>63)*(G3<96)THENG3=G3+128:GOT
O60100
60090 IF(G3>95)*(G3<128)THENG3=G3-64:GOT
O60100
60100 G0$=G0$+CHR$(G3)
60110 IFG4=1THENG0$=G0$+CHR$(146):G4=0
60120 NEXTG2:PRINT#4,G0$:NEXTG0
60130 PRINT#4:CLOSE4
60140 RETURN
```



Save the new version of the program, and you're ready to amaze your friends, delight your children and entertain yourself with biorhythm charts neatly printed and identified with each person's name. To print out the chart, hook up your printer, plug in your 3K expander, load the program and simply follow its instructions.

If you need to read all those weird graphic characters, just hit the Commodore and shift keys together, which will shift you into upper/lower case mode. For more clues to the reversed character keys, see your friendly user guide, page 133.

Thanks to Rich Weissman of Marlboro, New Jersey, who figured out how to do this.

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Microphys Programs

PET

VIC-20

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PET

VIC-20

Microphys, a leader in educational software development, is pleased to announce the release of several recreational software programs for use with the Commodore VIC-20 microcomputer. The VIC programs, described below, require a 3-K expansion cartridge and utilize the VIC's excellent color graphics and sound capabilities. Each program retails for $15 and is accompanied by complete instructions.

PROGRAM DESCRIPTIONS

PV901 - Missile Math: this program presents in a game format, an opportunity for youngsters (ages 5-15) to practice and develop the basic skills of addition, subtraction, multiplication, and division. Four levels of difficulty in each skill area may be selected. Problems in a given skill are randomly generated and missiles are launched at correct answers. The computer displays the results on each program run and may be directed to generate the same sequence of problems so that review and 'match play' (against an opponent) are possible.

PV350 - Cryptograms: this program permits the generation of 'secret' messages which are to be decoded. These cryptograms are displayed along with their unique code number classifications. To decode a cryptogram, the program is run from line 9000. Family members can challenge each other with their individually created messages. If you enjoy solving the cryptograms appearing in newspapers and crossword puzzle magazines, this program is perfect for you. Note: two VIC users may exchange encoded messages. User 1 creates a secret message and transmits this to user 2. The code number will permit user 2 to have **his** VIC decipher the message should he encounter any difficulty.

PV340-349 - Anagrams: this series of programs provides an educational challenge for virtually all age groups. The VIC randomly generates scrambled words which are to be identified. Two clues are provided in order to assist in this process. The clues in the school and college categories are generally definitive in nature. Many of the words used are part of the Microphys Spelling and Vocabulary series for the associated grade levels. Thus, reading, vocabulary, and spelling skills are reinforced by these Anagram programs. Note: the same sequence of words generated may be requested so that 'match play' is possible. There are 5 level-of-difficulty categories each consisting of two programs.

PV340-341 Recreational	PV342-343 College	PV344-345 High School
PV346-347 Junior High	PV348-349 Elementary	

PV375-380 - Wheel-of-Fortune Word Games: this series of programs represents an exciting challenge for every member of the family. Players try to fill in missing letters in a randomly generated title or phrase and earn and lose points according to the graphic display on a 'Wheel-of-Fortune'. The scores of as many as four players are displayed, 1000 points being required to win a given game.

PV375 Song Titles	PV376 Famous Places	PV377 Entertainers
PV378 Statesmen	PV379 Scientists	PV380 Sports Figures

PV601-644 - Missile Spelling: this series of 36 programs enables youngsters in grades 4 through 12 to practice and develop basic spelling skills. Each program contains 60 graded words. The VIC randomly selects groups of 5 words, one of which is spelled incorrectly. Missiles are launched in order to destroy the word misspelled. The words chosen for grades 7 - 12 correspond to the Microphys Vocabulary series. Note: there are 4 programs in each grade level.

PV601-604 Grade 12	PV606-609 Grade 11	PV611-614 Grade 10
PV616-619 Grade 9	PV621-624 Grade 8	PV626-629 Grade 7
PV631-634 Grade 6	PV636-639 Grade 5	PV641-644 Grade 4

PV401-460 - Vocabulary: each vocabulary program randomly generates graded words which are to be defined. A sentence, in which the word is properly used, is displayed when an incorrect response is made. Using this contextual clue, a second opportunity to define the word is given. Reading and spelling skills are also reinforced as a more powerful vocabulary is developed. There are 10 programs in each grade level.

PV401-405 and PV431-435 Grade 12	PV406-410 and PV436-440 Grade 11
PV411-415 and PV441-445 Grade 10	PV416-420 and PV446-450 Grade 9
PV421-425 and PV451-455 Grade 8	PV426-430 and PV456-460 Grade 7

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How To Succeed At VIC Games

by Bill Hindorff

Although they are normally locked away in a secret labyrinth in King of Prussia, Pennsylvania, our Game Group programmers do occasionally escape into the light of day. During those rare moments they sometimes stumble into the POWER/PLAY office carrying books, monitor cables, cartridges, briefcases filled with hamburgers and milkshakes—and a lot of valuable information for all our game fanatics. One such afternoon Bill Hindorff, aka Thrash (see our Premier Issue), wandered in and put this on the desk. Maybe it will be helpful, says he.

GORF

Astro Battles: While the Gorf is busy creating invaders, shoot as many as you can. As in VIC Avenger, kill the leading column by ducking under an invader, shooting, then moving away. DO NOT WAIT FOR YOUR SHOT TO FIND ITS MARK! The invaders are smart enough to concentrate their fire on your position. A word of warning. When two invaders are left, their speed doubles . . . when there is only one his speed doubles again.

Laser Attack: Try not to hit the laser ship until you've killed some support vessels. Once the lead laser ship is dead, the others will continually dive at you in anger. Go for the two side birds first.

Space Warp: This round is tough but by timing your shots, you can hit enemy ships as they appear in the center. Also, fireballs are targeted only once at the time they are fired. The lesson here is to move around to fake them out.

Flag Ship: The goal is to hit the red nuclear reactor at the center of the ship. Patience and a little luck are all that are needed. As in Space Warp, fireballs are only targeted once. Also, try to hit the flagship as soon as possible since it fires faster as it gets closer to you.

OMEGA RACE

Accuracy, as in most video games, is extremely important here. The best strategy is to apply thrust so that you're moving up and down. When you feel comfortable with the ship's motion, turn 90 degrees and blaze away.

RADAR RAT RACE

Just before the game starts, try to study the radar and make a mental note of where the cheeses are. Easy does it on your star screen since it throws you into a time warp which eats up the clock faster. If an enemy rat is on your tail, try to lead him into a cat. He won't be destroyed but it will gain you valuable time.

SUPER ALIEN

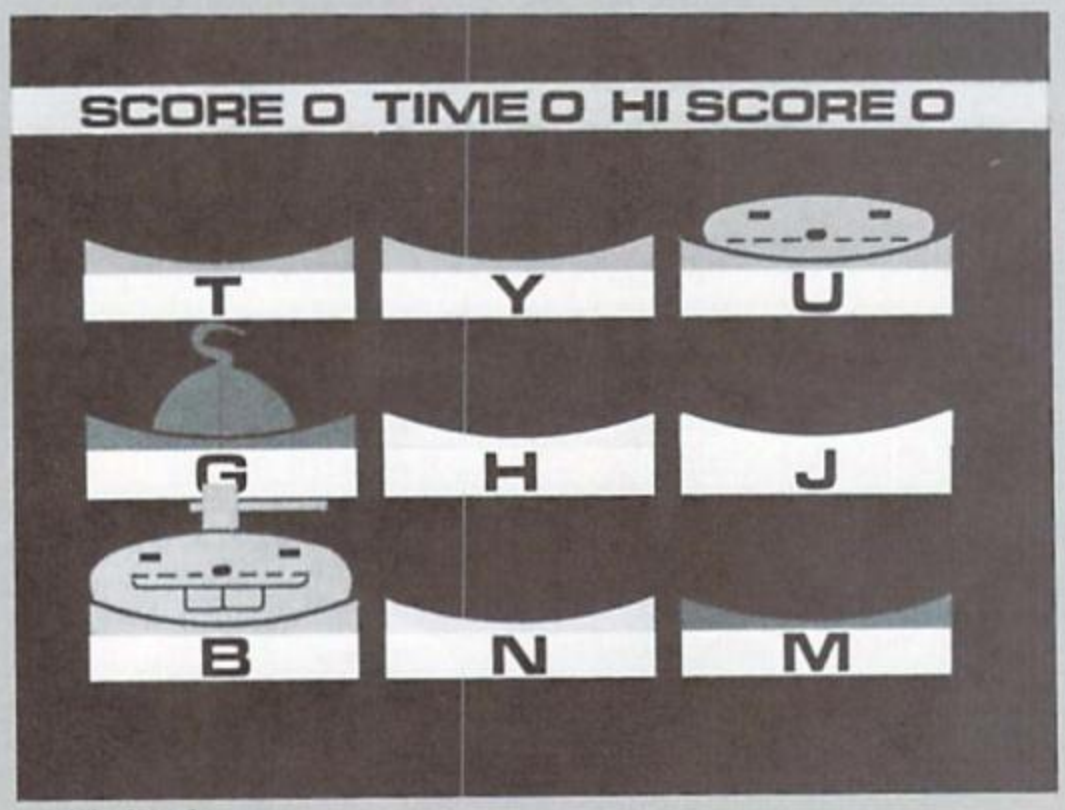
As soon as possible, block all paths leading to you with bubbles. It does not matter how close they are placed initially, just get them created. After you've caught a few aliens, or if you have time, enlarge your 'safe zone' by moving bubbles away from you. (Yes, you can also deflate any bubbles you create.) A word of warning . . . DO NOT GO AFTER A TRAPPED ALIEN IF HE HAS A BUDDY APPROACHING!!!! The second alien will release the first.

AVENGER

VIC Avenger follows the standard invader game. Remember to go after columns not rows.

SLOT

Always fill all slot directions. The odds of winning or at least breaking even are in your favor.



Mole Attack

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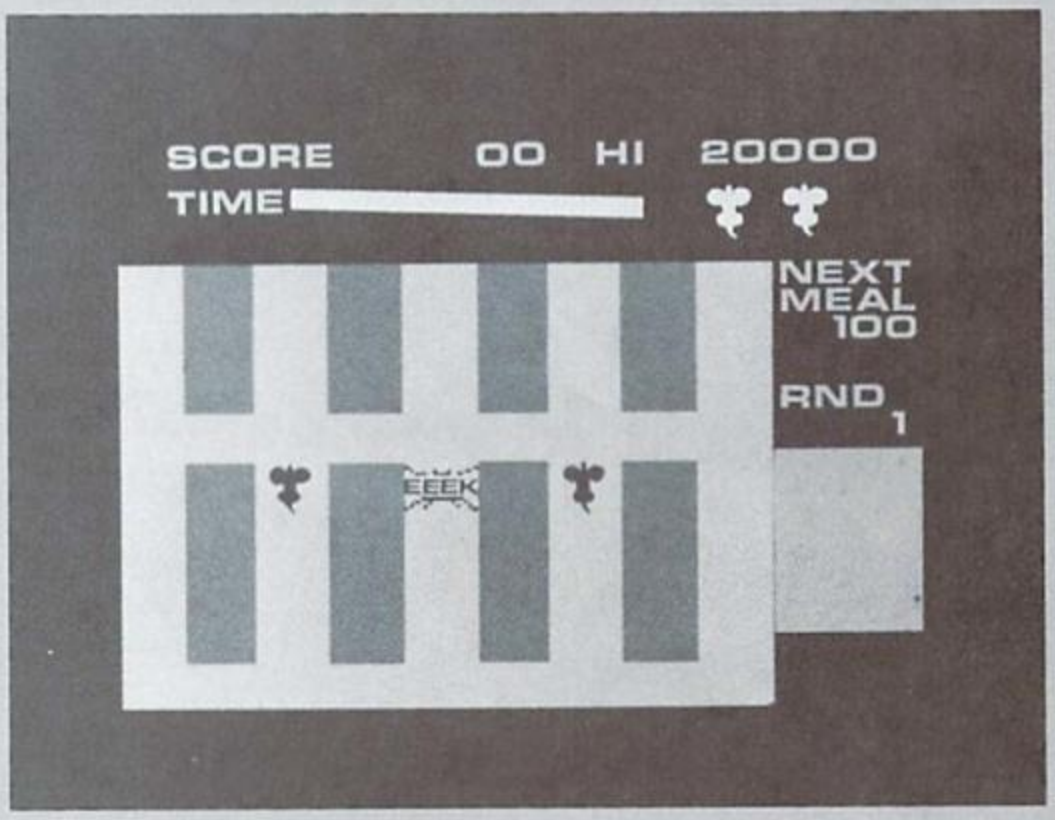
POKER
The standard rules of poker apply.

RAID ON FORT KNOX
The best clue here is . . . don't be afraid of dead ends. The cops won't follow you into one since they only change direction when they hit a wall.

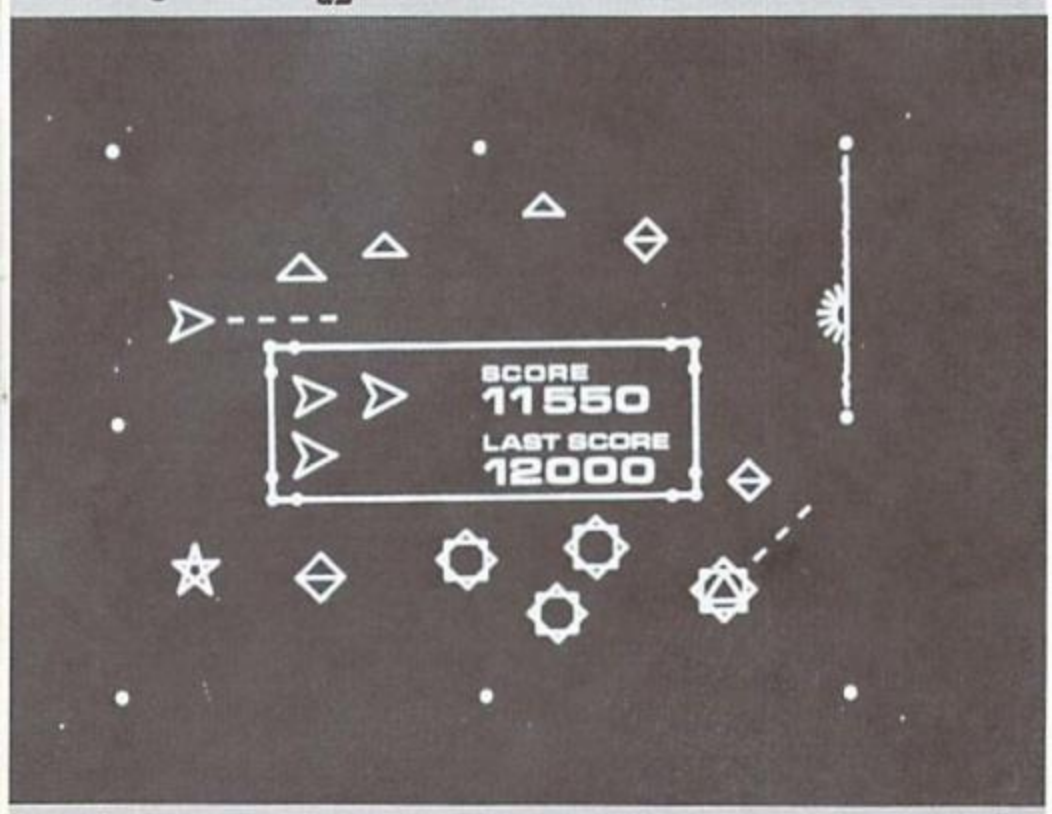
MOLE WARS
Hit them when they're low for the most points.

COSMIC CRUNCHER
Get to the outside at the start of the game. You then have access to the space warp tunnel and the space stations. Once you've cleaned up the perimeter, dock at a station then head for the center.

MIDNIGHT DRIVE
Shift into high gear as fast as you can. The object is distance so speed is essential. Keep the accelerator down till you start skidding then slow up. It is possible to steer while skidding by holding down both direction keys then lifting the same direction key as the skid. If you're skidding right lift your right finger etc . . .



Radar Rat Race



Omega Race

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for the 5K Commodore **VIC**

TOUCH TYPING TUTOR 2.0

Using these two programs you will learn to use all fingers when typing, and your typing skills and programming time will greatly improve. The first program contains 19 lessons for you to gradually master the entire keyboard. The keyboard and finger placement is shown on your TV screen, and you may practice with or without the character to be typed flashing on the screen keyboard. Using the second program you practice typing pseudo words in random length or 5 letter word groups at any speed. The letters occur at the same frequency as they appear in the English language. After practice of 85 characters, your word/minute rate is given, and the percent correct. You may list the errors made, and they are repeated as you continue the practice.

Cassette and manual $15.95
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Foreign shipping/handling $3.00.)

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*We've lifted this nifty little game from our British cousin publication, **VIC Computing.** (Commodore computers—notably the PET and VIC 20—are very popular in the U.K.) We've modified the original program listing a little, but other than that, the article is pretty much intact, as it appeared in **VIC Computing's** February 1982 issue. Thanks to editor Dennis Jarrett for not objecting.*

VIC RHINO

by Tim Duncan

Pet enthusiasts quiver with knowledgeable anticipation when rhinos are mentioned. This manic little game is now on offer from Tim Duncan, self-confessed rhino addict and proud possessor of a VIC. He's a postgraduate research student in Cardiff.

Someone once told me that more time had been spent in American computer installations on Lunar Lander, than on the whole of the space programme. I can well believe it, computer games are highly addictive.

I first became interested in micros when we had a short course on them in my second year at University. It wasn't long before I discovered that there were a whole range of games programs. One of the most popular at the time was Infoguide's 'Rhino', and I whiled away many a lunch hour on the PET, dodging the cantankerous creatures. So when I bought my VIC, just before Christmas, I decided to write a version that would fit into the VIC's 3.5K.

How to play VIC Rhino

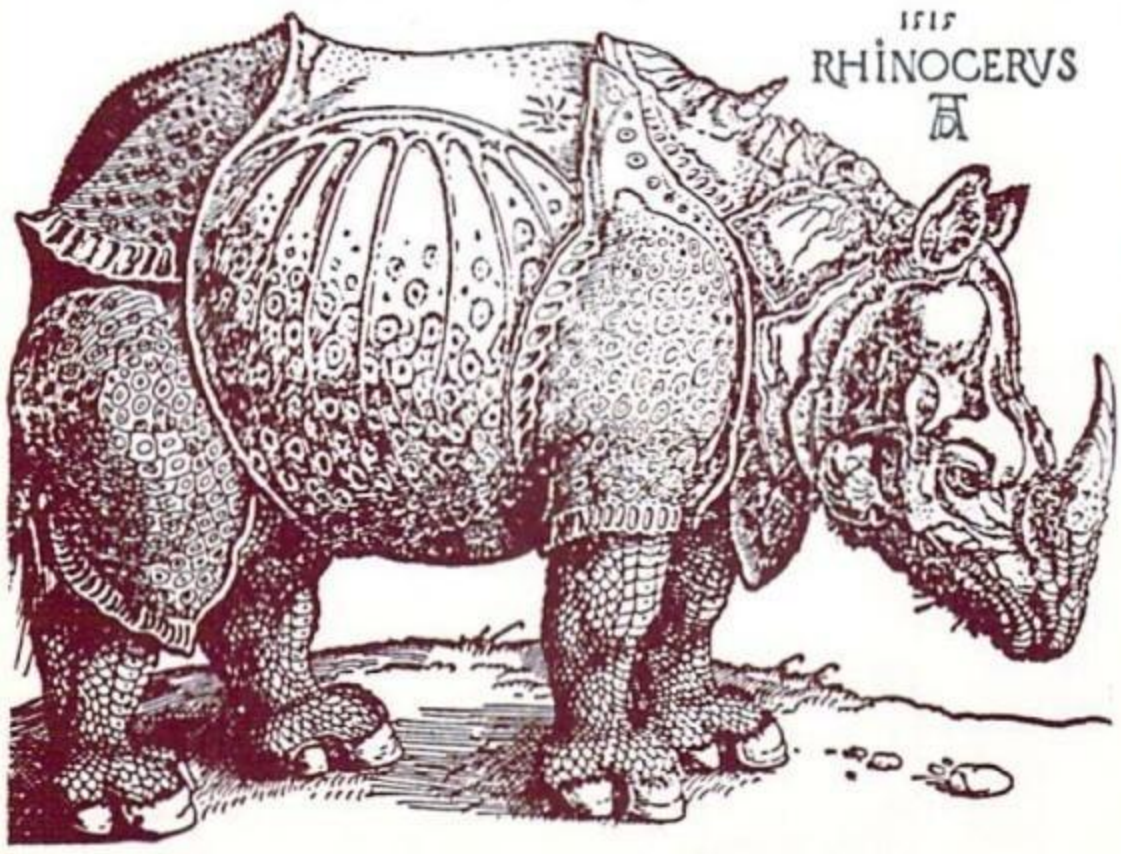
The scene is a hot African jungle. Hiding in amongst the trees are a number of rhinocerouses (rhinoceri?)—the top of the screen tells you how many. You are the white dot at the foot of the screen, and the aim of the game is to get safely through the jungle to your home ("H" at the top). You move by using the function keys:

Function keys	Function keys with shift
f1 = up	f2 = up/left
f3 = left	f4 = up/right
f5 = right	f6 = down/left
f7 = down	f8 = down/right

The trouble comes when a rhino sees you because it will chase you and stomp on you if it catches you. The rhinos only appear when you come into their direct line of vision—you'll get an "uh-uhh" sound when one is about to appear.

Each rhino can move only one square at a time, and VIC will wait for you to enter your move before the rhinos move again: you will see "YOUR MOVE" at the top of the screen. You have a slight advantage over the rhinos in that you can move diagonally through gaps in the trees while they can't.

When you get home safely, VIC will offer you another go . . . but this time there will be one more rhino! So how many rhinos can you dodge?



What the program actually does

Now for the benefit of those who haven't zoomed off to type in the listing straight away, I'll explain briefly how the program works. You may be able to pick up a few ideas that you can use in programs you write yourself.

VIC RHINO uses POKE statements to create the jungle and move the players around, so if you're not clear on POKE statements now's the time to look at the handbook. On a 5K VIC the address of the top left square of the screen (which I shall refer to as the Origin) is 7680. All the addresses used in the program are calculated from this address using X, Y coordinates to denote the line and column of the square concerned.

If you have added more than 3K memory expansion to your VIC you will find that the screen addresses are different. Since all the addresses here derive from the origin, all we have to do is change the value we use for our origin. Line 1001 will do this for you automatically.

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The main part of the program runs from line 1010 to 1030, using a number of subroutines to deal with specific tasks.

2000—sets up the screen
5000—checks your moves
6000—moves either you or a rhino
7000—decides when a rhino may appear
7100—provides sound effects
8000—decides the direction the rhino should move

The jungle is created by going square by square around the screen, and randomly POKEing reverse squares for the trees. The next two lines ensure that your home and the position you start from have several clear spaces around them. Lastly the routine produces random X, Y coordinates for each rhino, and stores them in an array.

Having set up the game, the program returns to 1010 and gets your move. I've noticed people often get carried away at the keys while the computer is busy moving the beasts: to make sure that the program ignores this POKE 198,0 clears the keyboard buffer just before getting the player's move. So keys will only register if pressed after "YOUR MOVE" appears.

An IF statement ensures that only the function keys are accepted, and the program goes to 5000 to check the move. The key is converted to a number in the range 1-8, but just to complicate matters the ASC codes of the keys are not the same as the numbers printed on the keys!

'M' Values	Key	Direction
1	f1	↑
2	f3	↖
3	f5	←
4	f7	↗
5	f2	→
6	f4	↙
7	f6	↓
8	f8	↘

If you are at the top of the screen (ie. X = 1) then the routine will disallow values which would move you upwards. Similarly, if you are at the bottom of the screen (X = 22) then values which move downwards are disallowed. (The use of a coordinate system makes it a simple matter to prevent the player moving off the edges of the screen (Y = 1 or Y = 21). Lastly the routine checks that the square is not already occupied. I have defined two functions FNX and FNY for evaluating values of X and Y for any move.

FNX(M)=(M=1 OR M=5 OR M=6)−(M>6 OR M=4)

It looks pretty strange doesn't it—never mind, all will become clear shortly.

When BASIC comes across a statement such as T=(M=2) it assesses the 'truth' of the expression in brackets—rather like an IF statement. If the expression (M=2) is false, then T=0: if the expres-

(continued on page 40)

```
0
1000 NR=3:O=7680:CO=30720:S1=36874:S2=S1+1:POKES1+4,10:POKE36879,
10:DIMR(20,2),V(20)
1001 IFPEEK(4096)<>0THENO=4096:CO=33792
1002 DEFFNA(X)=O+22*X:DEFFNX(M)=(M=1ORM=5ORM=6)-(M>6ORM=4)
1003 DEFFNY(M)=(M=2ORM=5ORM=7)-(M=6ORM=3ORM=8):PRINT"■■ RHINO
":GOSUB7300
1005 GOSUB2000
1010 NF=0:X=XH:Y=YH:CH=46:CL=1:POKE198,0:PRINT"■■■ YOUR MOVE ■"
1015 GETG$:IFG$<"■"ORG$>"■"THEN1015
1018 PRINT"■              ":GOSUB5000:GOSUB6000:RN=0:XH=X:YH=Y:
CH=94:CL=2:IFW>0THEN1990
1020 IFNF<NRTHENGOSUB7000
1021 IFRN=0THENGOSUB8000:IFW>0THEN1970
1024 IFRN=0THEN1010
1025 FORI=1TO10:IFV(I)=0THEN1010
1030 AD=O+22*R(I,1)+R(I,2):POKEAD,94:POKEAD+CO,2:NF=NF+1:NEXTI:GOTO1010
1970 X=XH:AD=FNA(X)+YH-1:POKEAD,26:POKEAD+1,1:POKEAD+2,16:T=50:C=0
1972 FORP=0TO2:POKEAD+CO+P,C:NEXTP:C=2+(C=2):POKES1,129+3*C:T=T-1:
IFT>0THEN1972
1974 POKES1,0:PRINT"■■ CRUNCHED";:GOTO1996
1990 PRINT"■■SAFE HOME";:GOSUB7300:IFNR<20THENNR=NR+1
1996 PRINT": ANOTHER GO?":POKE198,0:W=0
1997 GETG$:IFG$<>"Y"ANDG$<>"N"THEN1997
1998 IFG$="Y"THEN1005
1999 POKE36879,27:PRINT"■":END
2000 PRINT"■  THERE ARE "NR"RHINOS"
2010 FORI=O+22TOO+483:IFRND(1)>.75THENPOKEI+CO,5:POKEI,160
2012 NEXTI
2014 FORI=O+30TOO+118STEP22:FORJ=1TO5:POKEI+J,32:NEXTJ,I
2016 FORI=O+426TOO+470STEP22:FORJ=1TO5:POKEI+J,32:NEXTJ,I
2018 POKEO+77,8:POKEO+77+CO,1:POKEO+473,46:POKEO+473+CO,1
2060 FORC=1TONR
2070 Y=INT(RND(1)*16+3):X=INT(RND(1)*8+8):R(C,1)=X:R(C,2)=Y
2075 IFPEEK(FNA(X)+Y)<>32THEN2070
2080 NEXTC:FORC=1TO10:V(C)=0:NEXT:XH=21:YH=11:RETURN
5000 A=AD:M=ASC(G$)-132
5100 IF(X=1AND(M=1ORM=5ORM=6))OR(X=22AND(M=4ORM>6))THEN5110
5102 IF(Y=0AND(M=2ORM=5ORM=7))OR(Y=21AND(M=6ORM=3ORM=8))THEN5110
5104 AD=FNA(X+FNX(M))+Y+FNY(M)
5106 T=PEEK(AD):IFT<>32THENW=2:IFT<>8THEN5110
5108 RETURN
5110 AD=A:M=0:W=0:RETURN
6000 AD=FNA(X)+Y:POKEAD,32
6010 X=X+FNX(M):Y=Y+FNY(M)
6020 AD=FNA(X)+Y:POKEAD,CH:POKEAD+CO,CL:RETURN
7000 FORI=NF+1TONR:X=R(I,1):Y=R(I,2):IFV(I)=1THEN7060
7010 N=ABS(X-XH):IFN=0THENN=ABS(Y-YH)
7030 D=22*(XH<X)-22*(X<XH)+(YH<Y)-(Y<YH)
7040 FORJ=1TON:AD=FNA(X)+Y+J*D:IFPEEK(AD)=160THEN7060
7050 NEXTJ:IFPEEK(AD)=46THENRN=1:V(I)=1:GOSUB7100
7060 NEXTI:I=1:IFRN=0THENRETURN
7070 IFI=NR+1THENRETURN
7080 IFV(I)=0ORI=1ORV(I-1)=1THENI=I+1:GOTO7070
7090 V(I-1)=1:V(I)=0:SX=R(I-1,1):R(I-1,1)=R(I,1):R(I,1)=SX
7095 SY=R(I-1,2):R(I-1,2)=R(I,2):R(I,2)=SY:I=I-1:GOTO7080
7100 S=150:D=8:GOSUB7200:GOSUB7200:S=130:D=16:GOTO7200
7200 POKES2,S:POKE162,0:WAIT162,D:POKES2,0:S=0:RETURN
7300 D=3:S=231:GOSUB7200:GOSUB7200:Q=Q+1:IFQ=3THEN7310
7305 S=229:GOSUB7200:GOSUB7200:GOTO7300
7310 Q=0:S=223:GOSUB7200:GOSUB7200:S=228:GOSUB7200:GOSUB7200:
S=225:GOSUB7200:GOSUB7200
7320 S=219:D=32:GOTO7200
8000 FORI=1TONR:X=R(I,1):Y=R(I,2):IFV(I)=0THENRETURN
8020 FORM=0TO8:RM(M)=PEEK(FNA(X+FNX(M))+Y+FNY(M)):NEXTM
8030 A=3:B=1:C=6:GOSUB8800:B=4:C=8:GOSUB8800:A=2:C=7:GOSUB8800:
B=1:C=5:GOSUB8800
8040 FORM=0TO8:IFRM(M)=46THENW=1:GOTO6000
8041 IFRM(M)<>32THEN8044
8042 RM(M)=ABS(X-XH+FNX(M))+ABS(Y-YH+FNY(M))
8044 NEXTM:MV=110:M=0
8046 FORJ=0TO8:IFRM(J)<MVTHENM=J:MV=RM(J)
8048 NEXTJ:GOSUB6000:IFW>0THENRETURN
8050 R(I,1)=X:R(I,2)=Y:NEXTI:RETURN
8800 IFRM(A)=160ANDRM(B)=160THENRM(C)=160
8810 RETURN
READY.
```


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RHINO *(continued from page 39)*

sion is true (if M does equal 2) then T=−1.

Now, if we refer back to the table of M values we find that the three keys which move upwards give M values of 1, 5 and 6. So if the player wishes to move upwards, the expression (M=1 OR M=5 OR M=6) will be true but the expression (M>6 OR M=4) will be false; and therefore FNX will be (−1)−(0)=−1.

Suppose on the other hand, that we wanted to move down, M could not be 4, 7 or 8 with the result that FNX would be (0)−(−1)=+1. Thus X+FNX(M) will give us the new X coordinate for any move. FNY works similarly to give −1 for moves left, and +1 for moves right. Defining functions has the advantage that it uses less memory than a series of IF statements.

Having evaluated the move, the program then proceeds to 6000 which actually makes the moves. Again space has been saved by one routine to move both you and the rhinos. The variable CH determines which character is printed. The main part of the program now stores your present position and it is the rhinos' turn.

The first job is to see whether your move has brought you into a rhino's line of vision. For each of the rhinos that are still hidden, the program calculates the number of squares between you and the rhino. Line 7030 determines the direction using the principles we have just described. If (XH<X) is true then the rhino is below you, if (YH<Y) is true the rhino is to your right. In this example D would become −23.

If we added D to the rhino's present address, we would get the address of the square diagonally upward and to the left of the present square. The program checks each square along this line until it reaches the square you are on. If it has not encountered any obstacles, it has you in its sights and may appear. The RN flag is set and the subroutine at 7100 produces the ominous "uh-uhh" noise.

If no new rhinos have appeared the program will move to the routine at 8000 which calculates the best move for each rhino. It does this by considering each of the possible moves, rejecting those which are directly blocked and also rejecting moves along diagonal, if there is a tree on either side. The routine then calculates how far away you would be if it made that move, selecting the one which brings it closest to its prey.

The algorithm is fairly effective, but now that you know how it works, you can use it to your advantage to trap the rhinos. For example, since the rhino can't circle round the trees, you can amble on home while the nasty little thing fumes with frustration!

VIC RHINO will fit into the standard VIC, but will also run on expanded VIC's with no alterations necessary.

High Scores

For serious game players who thrive on competition, we'll be running the highest known scores for all Commodore games—cartridge and cassette. If you have a score that beats the existing record, send it in. But please remember you're on your honor, and phony scores will be on YOUR conscience, not ours.

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Debbie Hedin, Lincroft, NJ

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101,600
Paul Dubrouillet, Holland, PA

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45,700
Robert Schaeffer, Brookline, MA

MIDNIGHT DRIVE
14 km
Amber Brandon, Santa Cruz, CA

RADAR RAT RACE
95,060
Candice Brey, Phoenix, AZ

SUPER SLOT
3,906
Amber Brandon, Santa Cruz, CA

MOLE ATTACK
296
Candice Brey, Phoenix, AZ

DRAW POKER
12,819
Angie Traina, Jonesboro, LA

CAR CHASE
34,965
Michael Dickenson, Nahant, MA

SLITHER
189
D.C. Murphy III, Ames, IA

SUPER SLITHER
129
Robert Schaeffer, Brookline, MA

BLUE MEANIES
490
Robert Myers, New Lebanon, NY

GORF
11,140
Danny Cohen, Potomac, MD

SNAK MAN (from American Peripherals)
849,760
Debbie Hedin, Lincroft, NJ

We had several high scores come in too late to make this issue. We'll get them into the December issue. If your score didn't set a record this time, keep playing! Maybe you'll topple these champion gamesters next time!

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Adventure!!

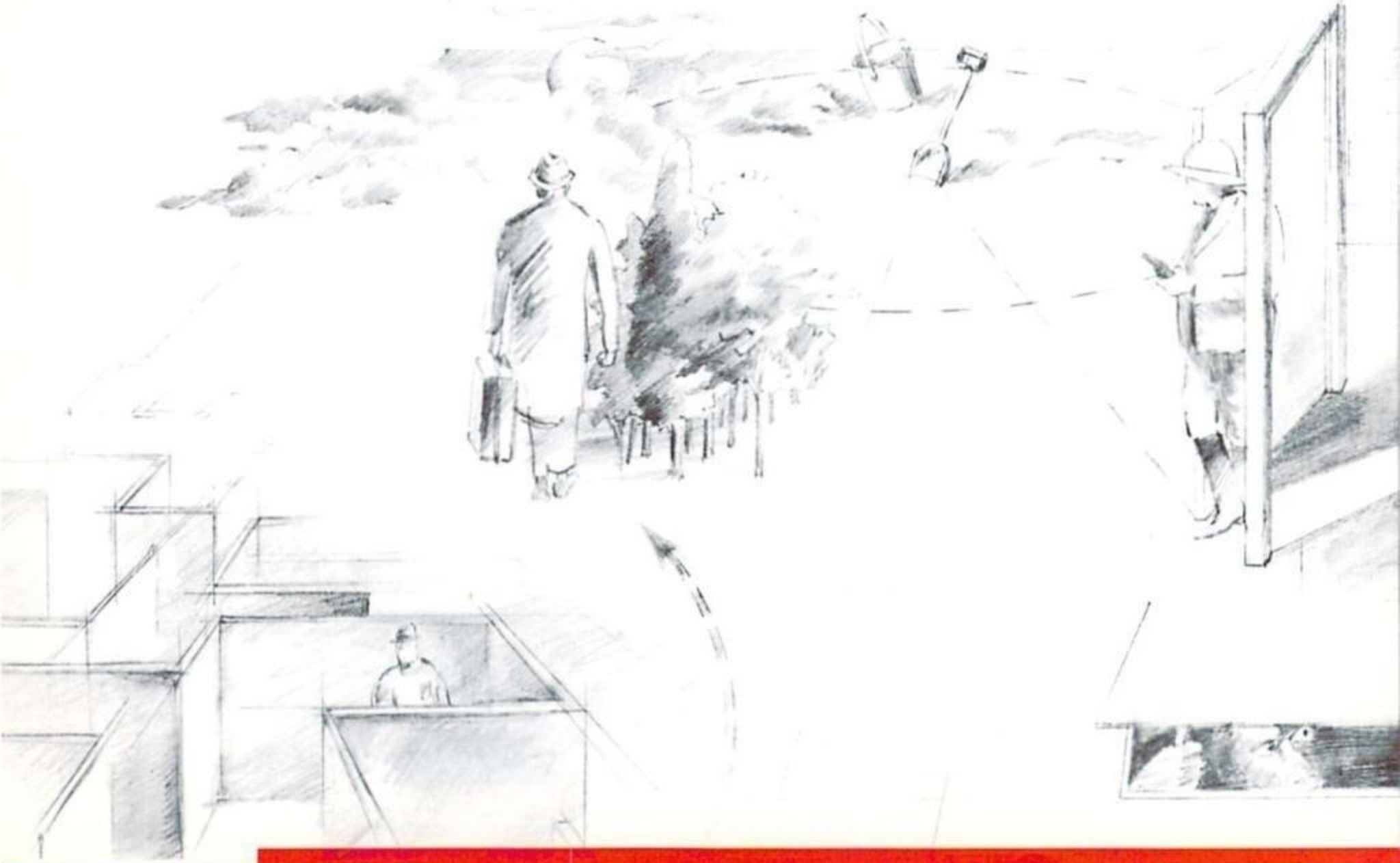
They told me Scott Adams' Adventure Games are challenging puzzles. They told me you have to use your head and pay attention to every detail when you play. They did not tell me I would gradually find myself applying Adventure thinking to real life situations. Or that I'd start to dream (night after night) Adventure dreams. They didn't tell me that even though I might escape from Voodoo Castle, I couldn't escape from the state of mind the games create.

Adventure Games ARE a state of mind. And notice I don't say "merely" a state of mind, because the mind is a powerful creative tool—a fact you begin to see very clearly as you play. When you play an Adventure Game, what you're actually looking at are just words on a screen. But what you're SEEING—really seeing, there in your mind's eye—is a dragon sleeping in a sunny meadow. Or a grass shack near a lagoon. Or a tiny door leading from a torture chamber to . . .?? The effect is better—and certainly more involving— than any TV show, because the pictures you create come out of your own mythic fantasies.

But let's not get heavy and psychological about it. Just because I happen to think Mr. Adams has tapped into some deep subconscious pool doesn't mean we have to take his games seriously. Does it?

They tell me it takes about six weeks to finish an Adventure, playing part-time. I can't vouch for that, since I haven't finished any, yet. But if that's true, it means the Commodore Adventure series, which includes Adventureland, Pirate's Cove, Mission Impossible, Voodoo Castle and The Count, could give you about seven months' entertainment. That's what I call a cheap date.

At first I thought the games were too "cerebral" for kids to play, until I turned my nine year-old daughter loose in Adventureland. She discovered a whole cavern I didn't know existed,



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Touring the Mythic Mind of Scott Adams

simply by daring to explore beyond where I'd gone. And she came to conclusions and realized possibilities that had escaped me, in my uptight adultness. So I'm firmly convinced that Adventure Games are for kids and adults alike.

In each game, you start out in a specific place, with a specific goal. The goal may be anything from acquiring treasure to preventing an explosion in a nuclear reactor. For instance, in Adventureland you always start out in a forest, surrounded by trees. You can travel north, south, east or west from there. You are told that in order to score in this game you must find TREASURES and store them, which means, among other things that you've got to find the storage place as well as the treasures.

Each game contains a completely consistent geography, but you get to look at it only one piece at a time. When you travel east from the forest in Adventureland, you always run into the same thing. If you travel south from there, you always get to the same place. But since you're

(continued on page 44)

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exploring only one step at a time, you've got to devise a way to keep track of where things are. That's where mapping comes in (see *Below*). Keeping a map is the essential method for remembering where things are, where you dropped or picked up something, and generally being successful in your endeavors.

Scott Adams' Voodoo Castle transports you to a mysterious chapel. You're looking at a closed coffin. What now?

I'd love to give you detailed clues, but since the point—not to mention the fun—of the games is figuring out the puzzling situations for yourself, I'm afraid I can't. After all, one of my most satisfying moments in Pirate's Cove came on a Saturday afternoon as I washed my car. I'd had a grueling Friday of falling off ledges and wandering around a maze of caves before I'd shut down the game in annoyance. But as I mindlessly sprayed water around, a light went on in my head and I suddenly realized what I needed to do to gain access to the treasure chest. Who am I to deny you that feeling of elation?

If I were going to give advice to a total novice, however, there are a few generalized things I could say. First and foremost: EVERYTHING is significant. Don't take ANYTHING for granted, explore EVERY possibility. If there's a window, do something to it. If there's a staircase, don't just stand there and look at it. Never, never ignore a key or a book or a crack or a hole. When in doubt call for help. If no help comes (which it sometimes doesn't) examine everything. If there's still no clue, try a different command (commands are generally two-word verb-noun combinations like "go lake" or "unlock door"). If that still doesn't clarify things go to Scott Adams' Book of Hints.

When all this fails, and you get so frustrated you could throw your VIC into the TV screen, save the game on tape and go away for awhile. Sometimes the solution you need is right in front of your face, but you need to back off to see it.

You can also start taking wild guesses in total abandon. After all, the worst that can happen is that you'll die, and it's a painless death, believe me. Your demise is usually announced with a mild reprimand like "That wasn't too smart . . ." but that's the worst of it. I've been blown up in a nuclear reactor (several times), smashed to bits in a desperate leap, poisoned by mamba snakes, and once even ended up being poked with a pitchfork by a fellow with a pointed tail, and have come back to tell the story. And I've also picked up some clues in the process—if only about what NOT to do.

However, if you're the type who's attached to staying alive, the "total abandon" approach probably won't work. What does work is good old common sense. Really put yourself into the situation. BE there. Start thinking as if your survival really depended on finding the right solution.

In short, the key to making it through the reality Scott has created is to treat it as if it really were reality. That means, for instance, if you want to chop down a tree, you'd better have found an axe, first. Or if you go someplace dark, you'd better have a light with you. It also means you have to remember the limits of that reality. If your command is to "examine things" you'll find out the computer doesn't know what "things" are, for instance.

After a while you start to adapt to Adventure thinking, so you get better at the games. But you can still run into frustrations. Sometimes that's caused by a slightly far-fetched command word, like the one you need to get out of the quicksand in Adventureland. I mucked around in there for almost an hour (not long by Adventure standards), before I got aggravated and dialed up our Game Group for a hint. Wish I could tell you what they told me.

Tuning your animal reflexes with games like VIC Avenger or Gorf is alright, but my mind keeps going back to the intriguing mystical quality of Adventures. It's that mystical quality, above all, that makes me keep plugging them in. Someday some smart kid will probably write a thesis about the psychological significance of Adventure Games, and then we'll all find out how crazy we really are. Until then, though, plug them in and enjoy them.

—Diane LeBold—

Mapping Adventures

This excerpt is reprinted with permission from ***Scott Adams' Book of Hints.*** *You can order the book, published by Adventure International, by calling Scott's toll-free number, 800-327-7172, or writing Box 3435, Longwood, FL 32750.*

THE FOLLOWING IS A METHOD
USEFUL IN MAPPING ADVENTURES

Each room is represented by a box with the name of the room in it, and all original items found in it noted alongside.

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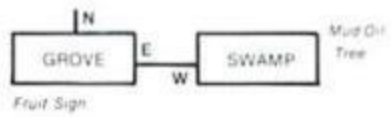
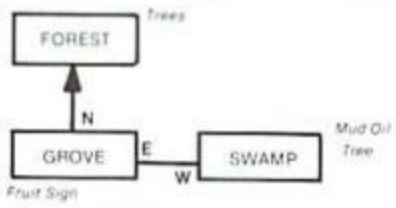
Directions from a location are indicated by a line coming out of anywhere on the box, but with the direction leaving the box indicated by the first letter of that direction.

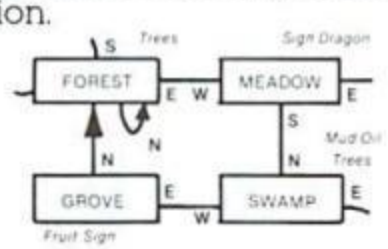


The above shows it is East from the grove to the swamp and West from the swamp to the grove. In the case of being able to go only in one direction, an arrow is put at the end of the path.

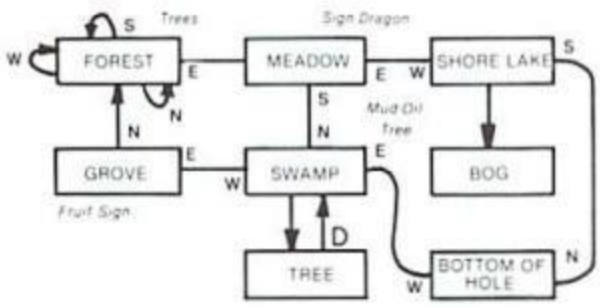


This indicates that upon leaving the grove you go north to the forest, but that you cannot return!

The best way to use this system is that, upon entering a location, you draw a line representing each possible exit and its direction. Later you connect them to rooms as you continue your exploration.



The advantage is that you will not forget to explore an exit once you get past your initial probe. Another advantage of this system is that you never need to redraw your map as you stick extra locations anywhere on your paper.



Also notice that on the forest the exits N, S, W are available, but that they all return to the forest! Note also that as additional locations were found off the swamp, the map was not redrawn. Instead, the locations were simply put where needed. And since we "climb tree" instead of going in a particular compass heading, we wrote that as directions to leave the swamp.

I hope you will find this an easy system to use. You should find that once you start using it, you will spend less time mapping or wandering around lost than you may have in the past! P.S.— Systems analysts may recognize this system as a modified HIPU diagram used to indicate program flow and control.

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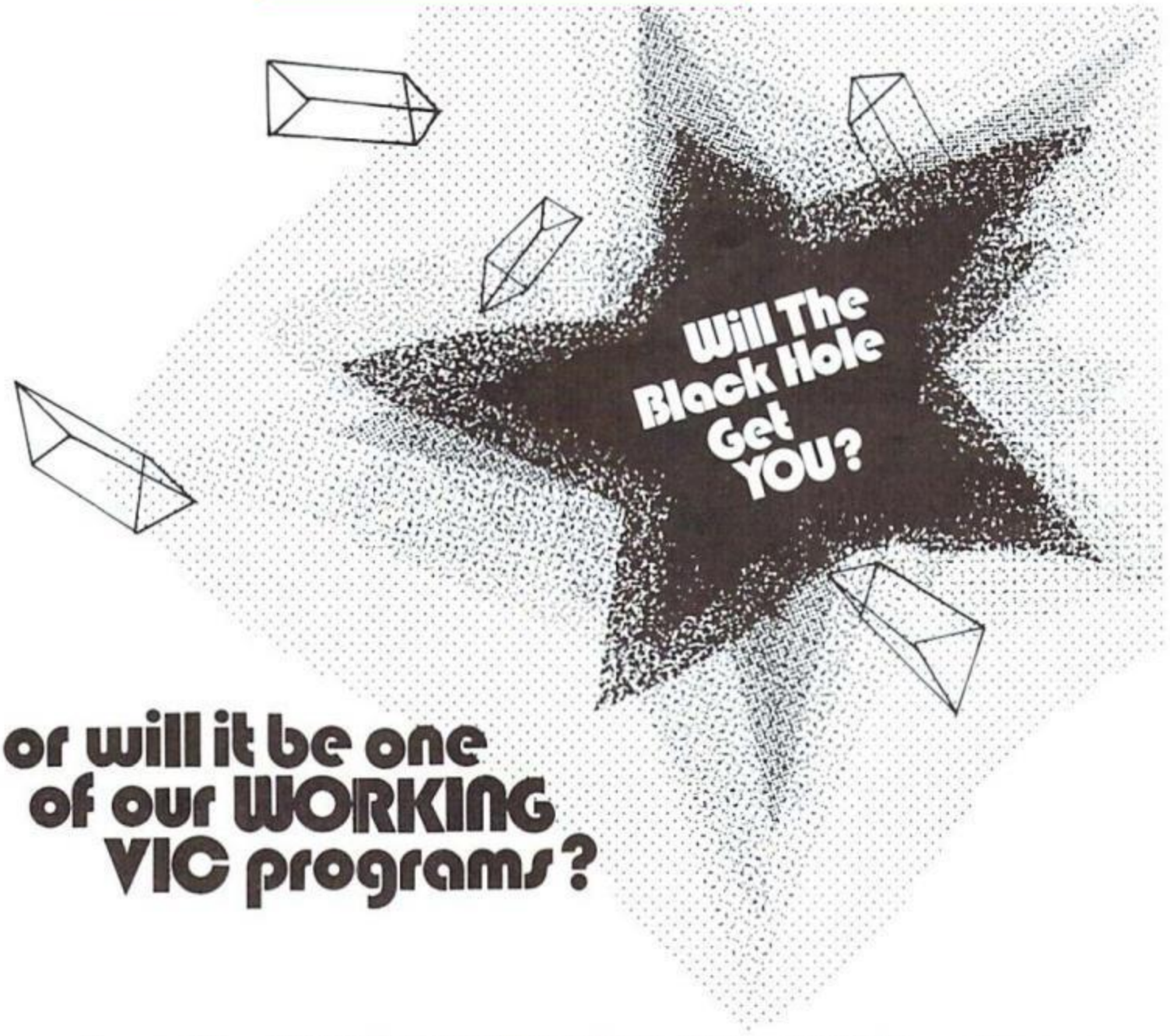

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ARE VIDEO GAMES ADDICTING?

Special for Power/Play Magazine

by DX Fenten

Peace. For a while there seemed to be peace. But, it didn't last. The gauntlet has, once again, been thrown down in this nationwide war being billed as "Some People Vs. The Video Games." Naturally, just as there are people who claim willingness to fight to the death the continued "proliferation of this hypnotizing, quarter gobbling obsession," there are also people who like to play the games and think they have every right to do this.

The fragile peace was broken by the announcement that a tiny village on New York's Long Island had taken one of the strongest stands yet of any municipality against video games. The ordinance that went into effect virtually immediately banned anyone under the age of 18 from playing video games in public unless accompanied by a parent or legal guardian. The town's Mayor, delighted with the law, said it had been passed "based on the observations by the elected village officials . . . and the problems that these machines have caused throughout the country."

This is just another in a long list of municipalities that have climbed on the anti-video game band wagon. To date, there are more than 30 of these towns and hamlets, in New York State alone, including New York City, that have passed laws to limit the spread of these public places or, as they are now called, "game parlors." There are also quite a few municipalities that have taken the slightly more moderate approach and simply declared a moratorium on the installation of these games.

The reason New York State, and Long Island in particular, are cited as examples in the Crusade to Defeat the Video Games, is Ronnie Lamm. This 35 year-old mother of two has become the nationally recognized leader of the ban-the-games-movement. Without really trying, Mrs. Lamm, by speaking out in her own town hearings on the subject, became an overnight media celebrity. She didn't like the video games because, she said, they were mesmerizing, addictive, compelling, mindless. And, that wasn't all. She also told anyone who would listen that the machines were taking quarters from children, that the machines were ruining the children's eyesight, that the machines were ruining the children's lunches and that the machines were making children gamblers.

The media loved it. A few mentions in newspapers, an appearance on network TV and people all over the country had a champion or, at least, they thought they did. What they really had was a mother and housewife who was concerned; not really over the games, or over the quarters, but really over the excesses. She was worried about her kids and everyone else's kids who whiled away hour after hour after hour popping quarters into arcade games, or even using the counterparts of these games on home television screens. It was the excesses that bothered her and a whole lot of other concerned parents throughout the nation and, it seems,

(continued on page 48)

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throughout some parts of the world. Last year President Ferdinand Marcos of the Phillipines had 3,000 coin-operated games dismantled, smashed or surrendered to his military police.

What's the real story behind these video games? Should there be a label on the side of each arcade game or on the side of each cassette or cartridge for the home TV games that warns, in red letters, "The Surgeon General has determined that excessive playing of this game can be detrimental to your health"? (and get you in trouble with your mother too.)

Unfortunately, because the video game phenomenon is so new, there hasn't been time for psychological, or any other, investigations. The only really official recognition by the medical community seems to be in a recent caution in the prestigious New England Journal of Medicine. The magazine warned long-time players to watch for "minor ligamentous strain."

But, investigations, expert opinions and just plain opinions are sprouting across the land like dandelions on a warm spring day. In a recent article in People Magazine, Sherry Turkle, assistant professor of sociology at MIT, suggests that the video game experience often has a very significant, positive impact. She says, "The kids are learning that computers are something you approach without intimidation, hands first, and take control of. Also, for many children, mastering the games is a way of learning what it feels like to learn." On the question of the violence some parents find objectionable in some video games, Turkle is very clear. She says, after interviewing hundreds of video game players over the past two years, there is no evidence that playing these games made these people any more prone to violent behavior. "Many of the games involve zapping weird little creatures that make strange noises and do things like turn into flying birds." All of this is accepted by the children as science fiction, she says, and so becomes imaginary.

Another sociology professor, David Sudnow of the University of California, Berkeley, suggests that the video games are really an extension of an assembly line mentality. "People work out a solution for themselves—a pattern, a way of responding, and then they use it over and over again. It becomes a very highly scripted, unvarying, perhaps a penultimate version of technologically controlled man." Sudnow gives good grades to the home versions of the arcade games because you can always hit the reset button and start again. You can improvise, amuse yourself and develop your own style, he says.

While the pros and cons of video games fly through the air with the speed of laser beams, some doctors and educators have moved ahead, undaunted, to find some fascinating uses for these popular games. One doctor has made the use of the games an integral part of his patients' rehabilitation program. The feeling is that the games help to improve eye-hand coordination, memory reaction time, intellectual capabilities and more.

In one special education school program, researchers found that the learning disabled children benefitted greatly from the multisensory stimulation that was provided by the games. In one study, the researchers reported that, after six weeks of carefully structured sessions, the children's motor accuracy, their eye-hand coordination and other abilities had all improved greatly.

One of the latest opinions on the subject of video games comes from Dr. Alex Comfort, best selling author, who is considered a leader in gerontology research. His books include *The Process of Aging*, and *The Joy of Sex*. Obviously an expert in the field, Dr. Comfort recently wrote, "Parents and city officials have been trying to stop their children from using lunch money to play video games. They may not realize that these games could put youngsters in touch with one of the most difficult ideas in modern physics." He is suggesting that youngsters playing these video games might be learning something of the advanced concepts of quantum physics.

Comparing some of the ideas that could possibly come out of the playing of these games, to those that exasperated Einstein and some of the diehard adherents of Newtonian physics, Comfort concludes, "But quite possibly the lunch money being 'wasted' playing video games will produce a generation to whom such ideas are not hard to swallow. When Einstein was a schoolboy, he used to wonder what it would be like to ride a light wave like a surfer. One cannot be sure that some of those quarters will not one day purchase a Nobel Prize."

And so the war, if only a war of words at this point, goes on. It will probably take years before there is any definitive answer to the question of the place of video games in our society. Whatever those findings are, it's safe to say that all the experts will be proven correct and here, as with anything else, it is the excesses that will hurt you.

When those of my generation were the age of the children playing the video games, we were warned about the evils of the pool halls. I can see Robert Preston now, led by my mother, marching down the street, singing the praises of being a Music Man rather than a pool player.

But, that was some time ago. For now . . . well, excuse me. I'm going back to my computer and my video games. It's time I started scoring a lot better, and then . . . winning?

DX Fenten is, among other things, author of the nationally syndicated column "Computer Bits." He also happens to be Garden Editor for ***Newsday*** *(Long Island, New York), which makes him a kind of organic computerist—perhaps the first of his genre.*

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The Incredible Expanding VIC

by Neil Harris

*(**Editor's Note:** Technical Editor Neil Harris originally submitted this article under the name Vic Jackson because he thought his wife would be upset if she knew who really wrote it. However, he later decided it would be alright to reveal his true identity ("I guess she knows me well enough by now," was his remark). We think you'll enjoy—and learn from—this story by the self-styled "Great Aunt Matilda of the VIC".)*

When I first brought my new VIC 20 home, my wife didn't know what we were getting into. She thought that we had a little video game hooked up to the livingroom TV, something that her odd husband used to make weird sounds and write programs.

For a while, all she saw was the VIC keyboard and the tape recorder politely sitting beside the TV. After a while, though, the sight of her oblivious husband playing with the keyboard and TV became old hat. She wanted to watch TV shows again.

"That's easy," I was quick to point out. "If we buy a small color TV, I can write it off as a business expense and you can watch movies again."

Little did she know what was in store.

Once I had a separate working area, I worked even faster. Soon, I had a whole box full of tapes and cartridges and books. Then came the printer. And the disk drive and modem—and a telephone to go with it.

In a short while, she noticed the sudden proliferation of equipment.

"What is all this stuff?" she wanted to know. "I thought you brought a toy home from work, and now you have enough hardware to run the space shuttle!"

"But I need all this," I countered. "Look, the modem lets the VIC talk to other computers over the phone."

"It's bad enough it talks to you. Now we'll have a phone bill to match the electric bill."

"Come on, you know that's not fair. This whole set-up only draws 100 watts, plus what little the TV uses. Your Trinitron upstairs uses more than that. The microwave sure does too. Anyway, I only need to make a local call."

I dialed CompuServe just to make the point. I jumped into the Associated Press wire and got the latest news on the Middle East crisis. I switched to electronic mail, finding a note from another Commodore employee across the country. As it happened, he asked me to meet him on the system's CB simulator at about that time, so I jumped to that. He was there waiting for me, and I introduced him to my wife through the keyboard.

"Where is he now?" she wanted to know.

"In California."

"What's this costing us?"

"Nothing more than anything else on the system, $5 an hour. Much cheaper than a long distance call for the same time."

"How come?"

I explained that each of us only had to make a local call and we were tied in to a computer in Columbus, Ohio. I could communicate with any of the people who were signed in at that time.

"What else can I do with this thing?" she asked.

"Almost anything. You can pick your area of interest from a menu of choices, and zero in on what you want by picking from other menus."

I let her fool around with the system for a while. A couple of times she got stuck, but I told her to just type the word 'help' and the system would explain what it was asking. She played with the shopping service, getting prices on some items to compare with what we'd paid.

"I did OK," she said.

"You're a good shopper." I replied.

"No, no, I meant with the computer."

"Of course. It's not hard, and you're an intelligent person."

"Hmph. What about the rest of this junk?"

I turned to the disk drive. "This little box stores all my programs, and other information I'm working with."

"What about this box here?" she asked, looking at the cardboard carton overflowing with my cartridges and cassettes.

"Well, disks are much faster than tapes. A

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EXPANDING VIC *(continued from page 51)*

tape that loads in a minute and a half might only take 5 seconds from the disk. And you can get 144 programs on only one disk. Not only that, but you can do random access on the disk."

"Why would I want to?"

"Let's say you put a mailing list into the computer."

"What kind of mailing list would I need?"

"Hmmm...Good point. Let's say you put in a list of all your artwork. You have prints, so you need to keep track of the name of the piece, number of the print within the edition, what medium was used, and the value. We could feed all that into the computer, and it could keep track of things for you. You could punch up a report on what you have at any time."

"Why couldn't I just put it on tape?" she asked.

"Suppose you spelled something wrong when you typed it in, or that you sold a piece. You would want to change some of the information without altering data around it. Tapes can't do that, because they're limited to going only forward and only from the beginning of the tape. They can't back up and record over a space, because they aren't precise enough. The disk drive can go pick up or change any piece of information from anywhere on the diskette. Operations like mailing lists or any other list just aren't practical without a disk."

"So you're getting more organized now?"

"Much!"

"Can this keep track of chores around the house that need doing?"

"Uh...I don't think so. Let me work on it."

"I'll bet. How about this little typewriter thingie?"

"That's a printer. It lets me print things on paper."

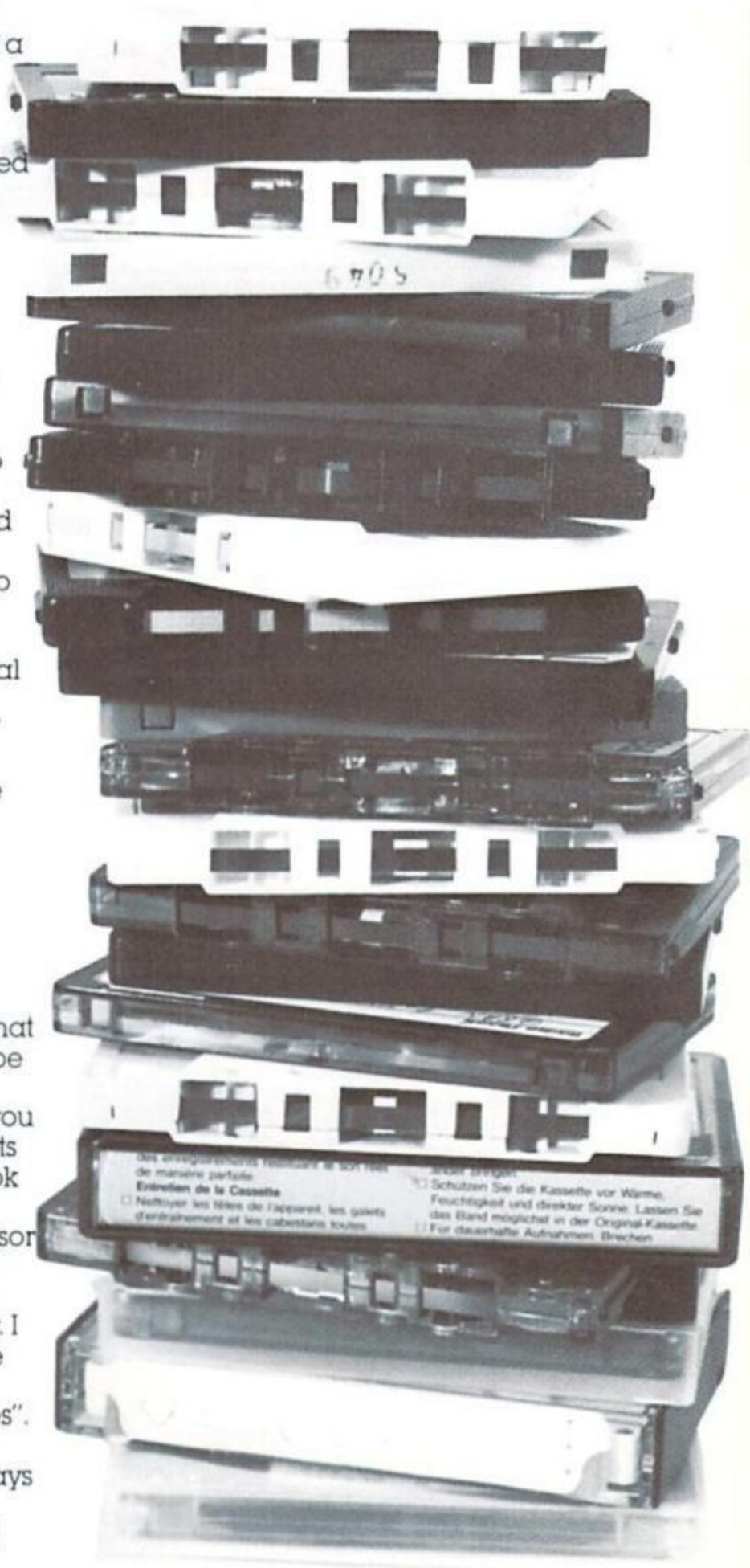
"Does it print what's on the screen?"

"Yes, but not only that. It can print things that aren't on the screen, and things that couldn't be on the screen. It does 80 characters on a line, and the screen's only 22 characters wide. So you can do much wider and more detailed reports on paper than on the screen, and you can look at all of it at the same time."

I loaded the VIC Typewriter/Word Processor program, and spent 15 minutes working with her on it, showing her how to edit her letters.

Eventually, of course, I created a monster. I tried so hard to show her all the benefits of the machine, she actually started using it herself. Now my wife never types, she "word processes". She even plays video games when I'm not around, just for fun! What do I do while she plays with my computer system?

I'm upstairs watching TV. Maybe she'll let me use the VIC again, someday.



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Want to move or copy a line or paragraph? Want to insert a something? **No problem,** a few simple practical keystrokes and it is done. Want to change a word because you have thought of a better word? Want to change a name everywhere it appears? Want to change some occurrences of a word? **No problem,** two (2) count them, two keystrokes set you up to do this.

Do most of your letters and reports have standard paragraphs in them? **No problem,** write them once save them on disk or cassette and use them thousands of times with only a few keystrokes of typing for each paragraph.

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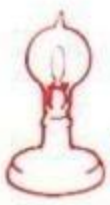

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POKEing Around in Expanded Memory

by Rick Cotton as told to Diane LeBold

When you add a memory expander to your VIC 20, things move around in the computer's memory that can change the POKE and PEEK commands you need. You can get the details in the *VIC 20 Programmer's Reference Guide*, available at your authorized Commodore dealer. But it might be helpful to have some background before you tackle the *Guide*, especially if you're a beginner.

Think of your VIC 20's memory as a set of shelves with 65,536 locations for boxes. Many locations already have boxes in them when you get your VIC. Other locations have no boxes; they're just empty space. Each location, with or without a box, has a number, from 0 to 65535.

Let's talk about locations that already have boxes. Each box contains one number, from 0 to 255. The contents of some of these boxes can never be changed. That's the Read Only Memory (ROM). You can only PEEK into those boxes. If you POKE into them, you won't get an error, but the number in the box won't change.

3,583 boxes contain mainly zeroes. They are at locations 4096 to 7679 in the unexpanded VIC, and compose the Random Access Memory (RAM) available for BASIC. When you put a program into the VIC, these boxes hold it.

Immediately below location 4096 (locations 1024 to 4095) there's empty shelf space and about 1K RAM for system storage. Above location 7679 there is 1.5K RAM with information about color, screen locations and sound. You can PEEK at this information or POKE it into the BASIC boxes. About another 23K is ROM. This includes things like BASIC, the Kernal, I/O and character memory.

In an unexpanded VIC, screen memory is in the boxes at locations 7680 to 8191 (right above the boxes that hold BASIC) and color memory is way up at locations 38400 to 38911, with a lot of empty shelf space in between.

When you add a 3K cartridge, 3,071 new boxes appear in locations 1024 to 4095, on the shelves just below the existing BASIC boxes. These new boxes also mainly contain zeroes, and hold more BASIC when you put a program into the computer. Nothing else moves.

But when you put in an 8K expander and set the dip switches for BASIC, screen memory moves down, color memory moves down and the 3,583 original BASIC boxes move up. The trick is to know where they've gone.

You'll now find all your BASIC boxes—the original 3.5K plus the new 8K—in locations 4608 through 16,383. Meanwhile, the screen memory boxes that used to be on some of the shelves now occupied by BASIC have moved down to locations 4096 to 4607. And color memory has moved down to locations 37888 to 38399. Everything else stays the same.

With a 16K expander everything is the same as with an 8K. The only difference is you've got about 8,000 more BASIC boxes stacked on top of the others, in locations 16,384 through 24,575.

Now that you know where your screen and color memory have gone, you need to know how to get to them for POKEing and PEEKing purposes. To find the new screen memory locations, subtract 3584 from the old location number. To find the new color memory locations, subtract 512 from the old location number.

For example, suppose the command on an unexpanded VIC is POKE 7680,1 (a screen memory command that puts the letter A in the upper right corner of the screen). The command on the 8K or 16K expanded VIC would be POKE 4096,1 because the memory box that controls the righthand corner of the screen has moved down 3584 spaces. The value you are poking into that box, however (the letter A, represented by 1), remains the same.

Or suppose you need to POKE the color memory locations and the unexpanded VIC command is POKE 38502,0 (the color black). The new command would be POKE 37990,0.

In both cases, you don't have to use a calculator to find the new location numbers. Simply type POKE, the old location number, minus 3584 or 512. (For instance in the first example above, you'd type: POKE 7680-3584,1)

The only problem you encounter with an 8K or 16K expander is in using programmable characters, because the character memory gets buried under the extra BASIC boxes. To fix that you need to change the existing pointers. But that's an article in itself, so we'll let it go for now. If you want more information, see the *VIC 20 Programmer's Reference Guide*, pages 83-84.

Just a word for those of you who want to get fancy and use both an 8K and a 3K in an expansion chassis. In that case, screen memory is at locations 4096 through 4607, as usual with the 8K expansion. But the 3K BASIC memory ends up underneath in locations 1024 through 4095. Although you can't get to the 3K for BASIC programming because it's now stuck under the screen memory, it comes in handy for machine language subroutines. If you'd like more details on that, take a look at the *Programmer's Reference Guide*.

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Tele/Scope

The Commodore Information Network

by Jeff Hand

Now you have direct access to Commodore—and your fellow home computerists—via your VICMODEM and telephone.

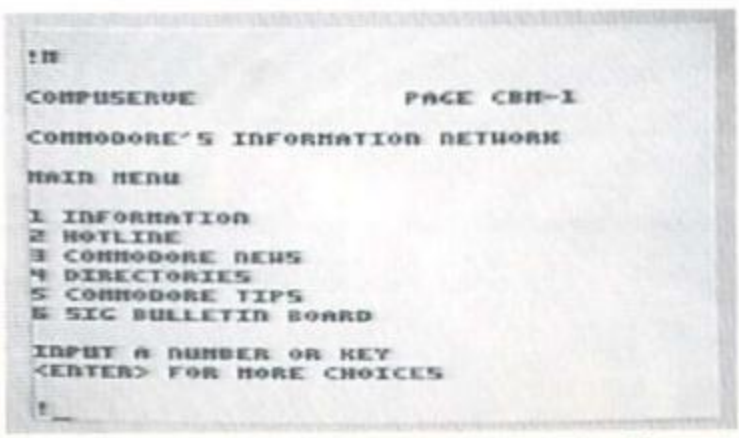
SOLUTIONS . . . Commodore introduces the answers to your problems! We call it the Commodore Information Network. It is designed for all beginners, computer telecommunications fanatics and anyone who fits between. The Network has been created to give you the information you want as quickly and efficiently as possible. Working jointly with CompuServe, we are committed to bringing you information, services and programs through the most sophisticated and convenient medium available—telecommunications.

At the present time the Network is developing in three stages: the information database, the SIG (Special Interest Group) bulletin board, and public domain software. To access the database, first get onto the CompuServe system (you get a free subscription when you buy a VICMODEM). After the first CompuServe prompt, type "GO CBM". This is what you will see as you enter the new and exciting world of the Commodore Information Network:

```
CompuServe                                  CBM-1
Commodore Information Network
Main Menu
1 Information
2 Hotline
3 Commodore News
4 Directories
5 Commodore Tips
6 SIG Bulletin Board
```

You can choose any section you want by typing the appropriate number and pressing <RETURN>.

1. The "Information" section offers you an explanation of the commands that are available in the database, a listing of direct access codes, and a description of the major sections of the database.
2. The "Hotline" gives you direct access to Commodore. You send us a question or request and receive an answer in your "electronic mailbox".



3. The "Commodore News" section contains applications articles from users around the world, the latest product announcements and our SIG bulletin board. (The bulletin board may also be accessed directly with option 6.)
4. The "Directories" section includes listings of dealers and user groups across the country . . . plus educational resource centers.
5. "Commodore Tips" is for your enjoyment. Whether you are a novice or advanced computerist, this section has something for you. Your most frequently asked questions (and some you never thought of) are presented here—with excellent answers. Check it out; you'll be very pleased.
6. "SIG Bulletin Board" allows you to access the bulletin board direct. That way you don't have to go through "Commodore News", so you save time.

The SIG bulletin board is one of the most active parts of the Network. Here you can meet people, trade ideas, sell equipment and get answers to questions. And, among other things, you are invited to attend some very serious, very informative and very enjoyable Commodore user group meetings. No matter where you are, you can attend. The cost of the plane ticket is a short trip to your computer.

For a super shortcut into the bulletin board, when you sign onto CompuServe just type in GO CBM310 at the first prompt. That skips all the rigamarole of going through menus and pops you right into the bulletin board. You can also get into the bulletin board direct through the Personal Computer Services (PCS50) section of CompuServe.

In the next few months we will include sections on Commodore's business (including corporate reports and stock quotations), a listing of Commodore-related books, book reviews, a complete retail price list, a listing of manual errata on all manuals, and, for the engineers in the group, semiconductor specs.

The third portion of the Network, tentatively scheduled for January, is free public domain software, including the Commodore "Program of the Month". Commodore is preparing a number of programs users can download into their systems. In addition, once a month we will choose an outstanding piece of software and offer it for sale on the Network at a very reasonable price.

The Network is also coordinating its efforts with COMMODORE Magazine and POWER/PLAY, so any programs printed in the magazines will also be available for downloading into your computer. This feature will eliminate the trouble of typing and debugging. When that service becomes available, it will be announced in each of the magazines.

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BOOK REVIEW

The VIC Revealed by Nick Hampshire

by Neil Harris

Where would the personal computer industry be without people like Nick Hampshire? Manufacturers are hard-pressed to document precisely every facet of their machines, especially when the machines are new. Systems are often released with only preliminary manuals. What's the poor defenseless owner to do? That's where the Nick Hampshires of the world come to the rescue.

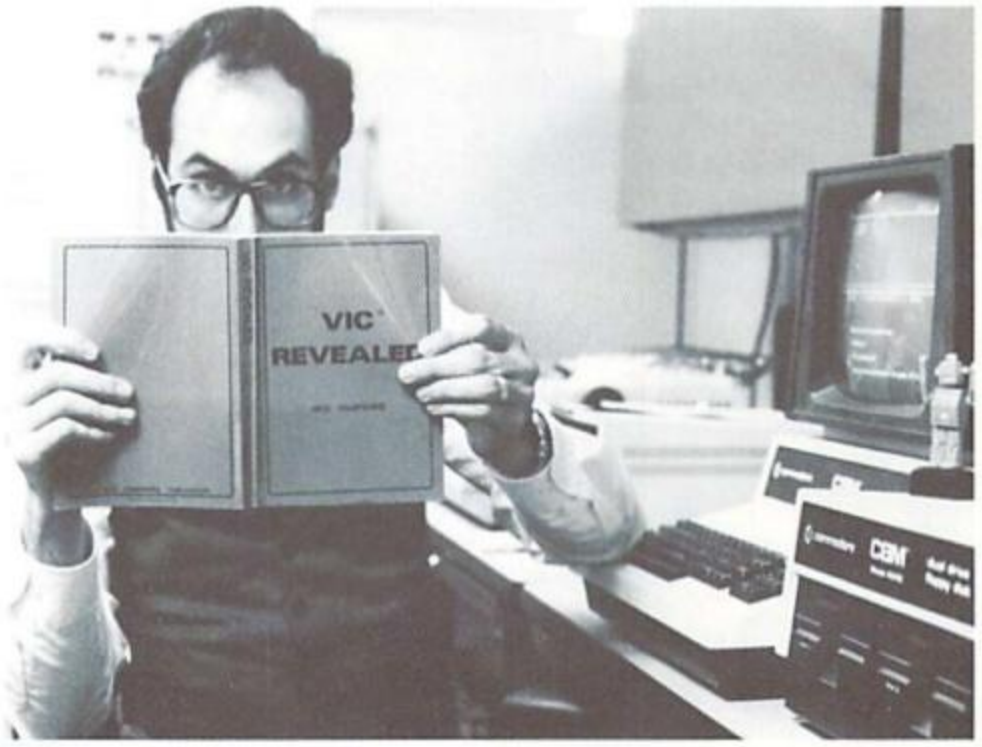
Nick Hampshire Publications in England released several books to help PET owners, including *The PET Revealed* and his excellent volume on *PET Graphics* (which may be of interest to VIC owners as well). Both these books are published in the USA by Hayden Books. His latest effort, *The VIC Revealed*, is only available in England so far, but should be available in the USA by November.

This book isn't for the timid—it faces the VIC from the point of view of the serious machine language programmers/engineers, the types who re-write game cartridges and build their own interfaces to control household appliances. As such, it can be (and is) considerably more rigorous in its approach than Commodore's own *Programmer's Reference Guide (PRG)* which has a much more general audience.

The VIC Revealed starts with the 6502 microprocessor chip and works its way outward through the ROMs, Video Interface Chip, and input/output functions. The ROM section includes a description and guide to using the BASIC ROM, which *couldn't* be in the *PRG* because of Commodore's original agreement with Microsoft. It also documents the technical guide of the cassette recorder better than any other source I've seen—so good that I recommend it to companies wanting to duplicate Commodore-format tapes.

The only bad news is the redundancy of material here with that in the *PRG*. The opening section of *The VIC Revealed* covers the 6502 chip, which is explained in greater detail in the *PRG*, and even more so in specialized 6502 books like *6502 Software Design*. The sections on the Kernal ROM, V.I.C. chip and I/O are very similar to that in the *PRG*.

So, for you software engineers who want your VIC to do *anything* you want, and for those of you who need to know what every little wave and bit does inside the machine, here is another must for your book shelf.



Neil Harris

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PROGRAM REVIEW

The VIC Typewriter (Word Processor)

by Bruce Robinson
President, Victory Software Corporation

For $14.95, the VIC Typewriter (VT-1009) is an excellent value. At Victory Software, we've been using it for our mailing list and general correspondence. We've found it easy and enjoyable to use (even for the non-computerists here).

A word processor allows you to type your text into the computer, review it, and then have it printed. You can save the text on tape or disk, and you can make as many printed copies as you want.

The VIC Typewriter will work in any memory configuration. You can get 45 VIC Lines of text on an unexpanded VIC, 185 VIC Lines with a 3K expander, and 417 VIC Lines with an 8K expander. A "VIC Line" is 22 characters, the width of the screen. An unexpanded VIC can handle 15 regular printed lines (64 characters across), 63 lines with a 3K expander, and 143 lines with an 8K expander. In practical terms, an unexpanded VIC can handle short notes, with 3K it is good for one full page, and with 8K it is good for two printed pages of text.

Text editing is a breeze. The controls work just like the regular editor that you use for entering a program. In addition, you can insert or delete an entire VIC Line.

Write a letter and print it on your VIC graphic printer. Check marks on the screen indicate line breaks in the printout.

You can review the text by skipping 1 or 20 lines forward at a time. Unfortunately, you can only skip backwards one line at a time. This is very annoying. There is also no way to skip to the beginning of text immediately.

When you are finished with your text, you can save the text in whole or in part to tape or disk. Unfortunately, when you load the text back in, it will be put in the same location in memory that it was saved from. This means that if you have any text files saved when using a 3K expander, you can't load the files with an 8K expander.

One feature that is missing from the VIC Typewriter that is found on a fully featured word processor is the ability to move parts of the text around (i.e. switch paragraph 1 with paragraph 5). However, you can print any part of the text that you want, so you can get around this limitation.

When typing in text, you don't have to specify the end of a line, the VIC Typewriter takes care of this for you when the text is printed. Of course, you can put in a carriage return wherever you want. The printout width is set at 64 characters, which is fine for most applications, but it would be nice if it could be changed by the user.

You can have enhanced (double size) printing and/or reverse printing. Enhanced printing stays on until you turn it off. Reverse printing stays on until you turn it off or if a carriage return is performed by the printer. The only way to insure that you get all that you want printed in reverse is to put the reverse printing command before each word to be printed in reverse.

The VIC Typewriter only allows printing in the upper/lowercase mode. You can't print graphics using the VIC Typewriter.

Obviously, if you don't have a printer, the VIC Typewriter is useless. If you do have a printer, you'll find that the VIC Typewriter is an invaluable aid. In fact, this entire article was written using the VIC Typewriter with an 8K expander. I strongly recommend that you get this utility if you have a printer and at least a 3K memory expander.

Also included on side 2 of the VIC Typewriter is a typing practice program. The program displays a randomly generated sentence (sometimes the sentence is a little silly, but it's for practice), and you are to type it in as quickly as possible. The program is good for drills. It is not, nor does it pretend to be, a typing tutor.

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TERMINAL-22 ($14.95)

Standard terminal software with screen dump to printer. 300 baud, full duplex only. Requires standard 5K VIC and modem.

GRAFIX DESIGNER ..... ($14.95)

Two-program set helps you design custom graphics characters. **GEN/EDIT** displays an enlarged 8x8 square; move the cursor around in it and turn dots on or off to form a character (holds 100). Erase, edit or recall at random. Load **DATAMAKER** when finished designing. Characters automatically become numbered data statements. Save them on tape just like a program. Instructions included for appending to any new or old program.

Build libraries of graphics ... throw away the graph paper!

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Two-program set makes GIANT headlines and banners on your printer. **HEADLINER** prints large characters across the page in three sizes. **BANNER** turns the characters sideways, printing continuously down the paper roll. Up to three lines of text, nearly unlimited in length. (How about a ten-foot long "WELCOME HOME"?) For VIC-1515 or RS-232 printers.*

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GRAFIX MENAGERIE ... ($14.95)

Demonstrate what your $300 miracle can do! Two-program set unleashes VIC's graphics. **SHOWOFF** contains Color Kaleidoscope, Arcade Critters, Custom Fonts, Electronics Schematic, and Music Notation.

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Improve your M/L skills as you study the VIC's ROMs. Fast disassembly to screen or printer, with handy hex/dec and dec/hex conversion. Includes key VIC addresses to study. For VIC-1515 or RS-232 printers.* This is the one we use.

RS-232 INTERFACE* .... ($49.95)

Get more OUT of your VIC. Plug-in interface communicates with most standard serial printers and modems. Simply plug into User Port; needs no external power. Bi-directional operation. 90 day warranty. Full instructions for use. Includes M/L handshake "wedge".

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Get Serious

What's happening on the POWERful side of Commodore products

Now it's time to get VERY serious about some dynamic additions to the Commodore microcomputer line. In the premier issue of Power/Play, you were introduced to two new computer systems, the Commodore 64 and the MAX Machine. Development of these products has progressed according to schedule, and microcomputer enthusiasts worldwide will not be disappointed with the surprising graphic and music capabilities of the MAX or the computing power of the highly sophisticated Commodore 64.

However, not pausing to rest on its laurels, Commodore has again expanded its complement of products with the introduction of three new machines—the "P500," "B700," and "BX700" series microcomputers.

The P500, which connects directly to a television set or monitor via built-in RF modulator, will feature 128K of RAM, 40 columns by 25 lines display, and 16 colors for either text or graphics. The P series will also feature a high resolution graphic display of 320 by 200 pixels.

In addition to the basic 128K of RAM, storage in the P500 is expandable to a maximum of 256K RAM internally and 640K externally. The machine will also become a multiprocessor system with the addition of a Commodore-designed Z-80 processor board that offers CP/M* compatibility. The P series computers are compatible with the full range of existing Commodore disk and printer peripherals.

The B700 series business-oriented micros, feature 128K of RAM, an attached 80-column green phosphor screen and built-in dual disk drives. This new B series computer is expandable to a maximum of 256K RAM internally with potential for 640K externally, and can accommodate an optional Z-80 processor board to provide CP/M compatibility. This new series also features an attached tilt/swivel display and detachable keyboard. Like the P series, the B machines are also compatible with the full line of CBM peripherals.

The BX700 is an enhanced version of the B series, with 256K of user memory standard, and with a 16-bit 8088 processor also included as standard. The 8088 processor allows users to access the existing library of CP/M-86 programs.

Each of these new micros includes a keyboard reflecting advanced features and comfort. A separate numeric keypad speeds data entry and includes a double zero key, a 'clear-entry' key and double size 'enter' key for ease of operation. A set of 10 programmable function keys is standard. These can be used to enhance applications by defining special word processing, scientific, or financial commands. Four separate editing keys plus individual cursor control round out this truly advanced keyboard design.

Other common features include built-in RS232 and IEEE 488 interfaces, real time clock, PET graphics set, and upwardly compatible Commodore BASIC. In addition, a unique Commodore-designed chip gives a full 3-voice music synthesizer, with 9 octave range. The machines include an output for direct connection to high quality sound systems. Also standard is a cartridge software slot which facilitates instant plug-in application and game software.

This new generation of Commodore microcomputers will be available late this year from authorized Commodore dealers nationwide. For additional timely updates on these and all significant developments, just grab a copy of Commodore Magazine where we REALLY "Get Serious."

Paul Fleming
Editor, Commodore Magazine

The new P series connects directly to a television or color monitor.

Commodore's B series features a tilt/swivel display and detachable keyboard.

The Other Editor's Note—*Despite having been labelled "stodgy" by Diane LeBold (you probably haven't noticed, but she is the editor of THIS magazine) for my conservative approach to publishing Commodore Magazine, I want to applaud what must have been a painful decision on her part. Namely, to provide her readers with this incredibly brief departure from "fun, games, and beyond" to acquire some insight into Commodore's other products. Thank you Diane. I hope it was stodgy enough for you.*

*CP/M is a registered trademark of Digital Research

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Future File

New Hardware For VIC 20

From RAK Electronics
P.O. Box 1585
Orange Park, FL 32703

VIC MORSE allows your VIC 20 computer to become a morse terminal for your amateur radio station. It is capable of sending and receiving morse code at speeds up to 25 wpm. Includes multiple 255 character message buffers, special function keys, type-ahead keyboard buffering and automatic speed control on receive. Requires C2N cassette recorder and at least a 3K memory expander for full capabilities. Software is written in BASIC for ease of modification. Requires construction of two transistors, one IC interface (schematic and instructions included).

VIC RTTY turns your VIC 20 into a RTTY terminal. Split screen operation, four 255 character user defined messages, 60, 66, 75, 100 wpm BAUDOT speeds, morse code ID, RTTY ID (his call and yours), RTTY CQ message, special UNSHIFT ON SPACE option. Requires 8K memory expansion, recorder and VIC-to-radio interface. The interface requires some construction, ranging from simple 1 IC TTL interface to multi-IC modulator/demodulator.

From Arfon Microelectronics, Ltd.
Central U.S. Distributors
111 Rena Drive
Lafayette, LA 70503

VIC 20 EXPANSION CHASSIS fully expands the VIC 20 memory, plugs in interfaces for data retrieval, and controls applications, other peripherals, cartridges for expanded BASIC language functions and programming utilities. With the new expansion chassis, the VIC 20 has the same potential computing power as computers costing five times as much.

The chassis has seven expansion slots, all aluminum construction, large power supply with torodial transformer, five volt supply to the VIC for cooler operation and twenty-four volt supply for the Arfon Micro VIC Printer. Detachable cover protects cartridges and makes VIC and Expansion one portable unit. Holder for RF modulator.

Best Books

Mindstorms by Seymour Papert: Basic Books

Picture This! PILOT Turtle Geometry by David Thornburg: Addison-Wesley

Turtle Geometry by Harold Abelson & Andrea diSessa: MIT Press

Every Kid's First Book of Robots and Computers by David Thornburg: COMPUTE! Books

The First Book of PET/CBM: COMPUTE! Books

The First Book of VIC 20: COMPUTE! Books

Computer Games by J. Victor Nahigian & William S. Hodges: Winthrop Publishers, Inc.

Basic BASIC by Donald M. Monro: Little, Brown & Company

PET/CBM BASIC by Richard Haskell: Prentice Hall

Running Press Glossary of Computer Terms by John Prentis: Running Press

The BASIC Conversions Handbook for Apple™, TRS-80™, and PET™ Users by David A. Brain *et al.*: Hayden Book Company

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Commodore VIC 20 Price List

ORDER NUMBER	PRODUCT NAME AND DESCRIPTION	RETAIL PRICE
THE VIC 20 SYSTEM HARDWARE AND PERIPHERALS		
VIC20	**VIC 20—The Friendly Computer** Commodore's revolutionary personal computer features color, sound, graphics, programmable function keys, built-in BASIC, expandable memory, low-priced peripherals and more! Connects to any TV or monitor. Includes RF modulator, switchbox, cables and self-teaching instruction book.	$299.95
VIC1530	**Commodore Datassette** Provides handy economical storage of user-written or pre-recorded programs using ordinary audio tape cassettes. Works like standard tape recorder; includes tape counter.	75.00
VIC1540/1	**VIC 1540/1 Single Disk Drive** Fast, high capacity storage and retrieval of data on standard 5¼-inch floppy diskettes. Stores up to 170K on each diskette, with read/write compatibility with PET/CBM computer systems.	399.00
VIC1515	**VIC Graphic Printer** Economical dot matrix printer makes paper copies of BASIC programs, letters, business data and graphic displays. Connects directly to the VIC, prints all characters including letters, numbers and graphics. Prints 80 columns wide, 30 characters per second. Reliable tractor feed mechanism. Device 4/5 and test switch. Accepts sprocketed 8-inch roll or sheet paper.	395.00
VIC1600	**VICMODEM (Telephone Interface)** Lets VIC owners communicate by telephone, access telecomputing and timesharing services. VICMODEM cartridge plugs into the VIC's user port, connects to any modular-jack phone handset. Includes VICTERM 1 terminal program on tape. (Software included)	109.95
VIC1311	**JOYSTICK** Single joystick for playing computer games, remote control computing. Connects to VIC Game Port.	9.95
VIC1312	**TWO PLAYER GAME PADDLES** Double paddle controllers for two player game action. Full rotation with "fire button." Connects to VIC Game Port.	19.95
MEMORY EXPANSION CARTRIDGES		
VIC1210	**VIC 3K Memory Expander Cartridge** Plugs directly into the VIC's expansion port, expands memory to 8K RAM total.	39.95
VIC1110	**VIC 8K Memory Expander Cartridge** 8K RAM expansion cartridge plugs directly into the VIC.	59.95
VIC1111	**VIC 16K MEMORY EXPANDER CARTRIDGE** For use with VIC 20 and/or VIC1010 EXPANSION MODULE.	109.95
INTERFACE CARTRIDGES		
VIC1011A	**RS232C Terminal Interface** Provides interface between the VIC 20 and RS232 telecommunications modems. Connects to the VIC's user port. (Not required for modem)	49.95
RECREATIONAL GAMES ON CARTRIDGE		
VIDEO ARCADE SERIES		
VIC1901	**VIC AVENGER** It's an invasion of space intruders and you're the VIC "Avenger." Space action for arcade enthusiasts.	29.95
VIC1904	**SUPERSLOT** Colorful slot machine game works just like the real thing! Great music and sound effects!	29.95
VIC1906	**VIC SUPER ALIEN** You're trapped in a maze and your only defense is the "alien buster." Can you capture the aliens before they zap you?	29.95
VIC1907	**JUPITER LANDER** Pilot your "Jupiter Lander" through the treacherous crevices of a mysterious planet. Variable rocket thrust, anti-gravity, horizontal retros.	29.95
VIC1908	**DRAW POKER** Casino-style poker recreates the real thing! Superb animation and sound effects add to the fun, mystery and luck.	29.95
VIC1909	**MIDNIGHT DRIVE/ROAD RACE** Authentic night driving simulation provides thrills, chills and ... spills? An unusual computer challenge.	29.95
VIC1910	**RADAR RAT RACE** The magical mystical mouse maze makes for a fast-paced, challenging game of wit, strategy and reflexes. Excellent graphics.	29.95
VIC1913	**RAID ON FORT KNOX** You're scurrying through a complex of tunnels below Fort Knox. Just ahead you spot the gold . . . now grab it and try to escape before the guards find you!	29.95
VIC1919	**SARGON II CHESS** SEVEN challenging play levels. Called the "best" microcomputer chess program by experts, SARGON II makes the VIC a challenging chess opponent.	39.95
VIC1923	**GORF™ (The smash-hit arcade game!)** Midway's incredible coin-operated game is now on cartridge for the VIC! Includes 4 completely different games, multiple levels of difficulty, some of the best cartoon graphics ever devised for video games. Invaders, gorfies, death ships, saucers, aliens . . . it's terrific!	39.95
VIC1924	**OMEGA RACE™ (The smash-hit arcade game!)** The ultimate space game. One of the most popular coin-op games of the year! You've got one Omegan fighter maneuvering against droid ships, command ships, death ships, photo mines and vapor mines. Fantastic "rubber band" boundaries, multiple levels of difficulty . . . all the features that made the Bally/Midway game so successful! 1 or 2 players.	39.95
SCOTT ADAMS ADVENTURE GAMES		
VIC1914	**ADVENTURE LAND ADVENTURE** The premiere Scott Adams "Adventure" game ideal for beginning "Adventure" players. Formerly available only on larger, more expensive computers. All Adventure games are decoded to "talk" on the "TYPE N TALK™ voice synthesizer (available from VOTRAX).	39.95
VIC1915	**PIRATE COVE ADVENTURE** Yo, ho, ho and a bottle of rum . . . much more in this treasure island of excitement. Decoded for TYPE N TALK™ by Scott Adams.	39.95
VIC1916	**MISSION IMPOSSIBLE ADVENTURE** Your mission is to disarm a volatile nuclear reactor. Tense, challenging fun. Decoded for TYPE N TALK™ by Scott Adams.	39.95
VIC1917	**THE COUNT ADVENTURE** You're trapped in Count Dracula's castle and you have 3 days to find and destroy the vampire. Decoded for TYPE N TALK™ by Scott Adams.	39.95
VIC1918	**VOODOO CASTLE ADVENTURE** Count Yorga has been cursed and you have to free him from the curse. Voodoo statues, crystal balls and magic rings. TYPE N TALK™ by Scott Adams.	39.95
CHILDREN'S FUN SERIES		
VIC1911	**THE SKY IS FALLING** Help Chicken Little by catching pieces of the sky as they fall! A great "first game" to teach motor skills . . . fun and challenging.	29.95
VIC1912	**MOLE ATTACK** A colorful "cartoon action" game. You're trying to keep those nasty moles underground where they belong but they keep popping up! How many can you clunk before time runs out? Fast, fun, frantic!	29.95
PROGRAMMING AID CARTRIDGES		
VIC1211A	**VIC 20 Super Expander** Everything Commodore could pack into one cartridge—3K RAM memory expansion, high resolution graphics plotting, color, paint and sound commands. Graphic, text, multicolor and music modes. 1024 x 1024 dot screen plotting. All commands may be typed as new BASIC commands or accessed by hitting one of the VIC's special function keys. Includes tutorial instruction book. Excellent for all programming levels.	69.95
VIC1212	**Programmers Aid Cartridge** More than 20 new BASIC commands help new and experienced programmers renumber, trace and edit BASIC programs. Trace any program line-by-line as it executes, pause to edit. Special KEY command lets programmers redefine function keys as BASIC commands, subroutines or new commands.	59.95
VIC1213	**VICMON Machine Language Monitor** Helps machine code programmers write fast, efficient 6502 assembly language programs. Includes one line assembler/disassembler.	59.95

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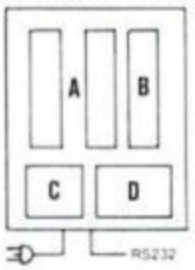

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Commodore VIC 20 Price List
(continued from page 63)

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	TEACH YOURSELF PROGRAMMING SERIES	
VL102	**Introduction to BASIC Programming – Part I** A gentle but thorough introduction to BASIC programming. Excellent first book for any new computerist. Tutorial lesson tapes included.	24.95
	APPLICATION PROGRAMS ON TAPE	
	The following prerecorded programs are designed for use with the Commodore Datassette Tape Recorder. Programs on tape come in several varieties and are color coded by category as follows: Recreation (red), Education (blue), Business/Calculation (green), Home Utility (orange) and Computing Aid (black).	
VT106A	**Recreation Program Pack*** Car Chase – Fast-paced road action VIC 21 – Casino-style blackjack Blue Meanies From Outer Space – Space game Biorhythm Compatibility – Compare biorhythms Spacemath – Math improvement grades 1-6 Slither/Super Slither – dexterity game	59.95
VT107A	**Home Calculation Program Pack*** Personal Finance I – Home budget Personal Finance II – Home budget VIC Typewriter – Word processor for home use Expense Calendar – Income, expenses, appointments Loan & Mortgage Calculator – Decision-making aid Home Inventory – Home belongings list	59.95
VT164	**Programmable Character Set/Gamegraphics Editor** Lets the VIC user create up to 64 programmable characters and use them in BASIC programs. The Editor takes only one-half kilobyte of program space, works with tape, disk and printer.	14.95
VT232	**VICTerm I – Terminal Emulator** A handy VIC terminal program on tape which converts any VIC to a terminal for use with a telephone modem. (See RS232 Interface)	9.95
	VIC 20 BOOKS AND MANUALS	
VM100	**PERSONAL COMPUTING ON THE VIC 20** The "friendliest" computer instruction guide available. The owner's manual comes free with every VIC 20 but is also in demand by teachers who use it in the classroom, and by "VIC families" who want more than one guide for each family member.	5.95
VM110	**VIC 20 PROGRAMMERS REFERENCE GUIDE** The master VIC 20 reference manual includes information on VIC BASIC, 6502 Machine Code Programming, Input/Output ports, VIC microprocessing chips, and tips for all levels of programmers. Indispensable.	16.95
	ACCESSORIES AND REPLACEMENT PARTS	
VIC1515P	**VIC GRAPHIC PRINTER PAPER** 1000 sheet pack, tractor feed, 15 lb. bond	15.00
VIC1515R	**VIC PRINTER RIBBON CARTRIDGE** for VIC Graphic Printer	9.95
VIC90477801	**TV SWITCHBOX**	7.95
VIC90510101	**RF CABLE**	2.95
VIC902505	**POWER SUPPLY**	19.95
VIC32145301	**MODULATOR**	19.95

*Bally Midway games developed under Commodore's licensing agreement with Bally Manufacturing Co.

*Suggested retail price of six pack tapes sold separately is $14.95.
Prices are subject to change without notice.

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25 of The Hundreds of Reasons You Ought To Be A **COMPUTE!** Magazine Subscriber:

From "The Editor's Feedback" Card, a monthly part of our continuing dialogue with readers of **COMPUTE!**. These are responses to the question,

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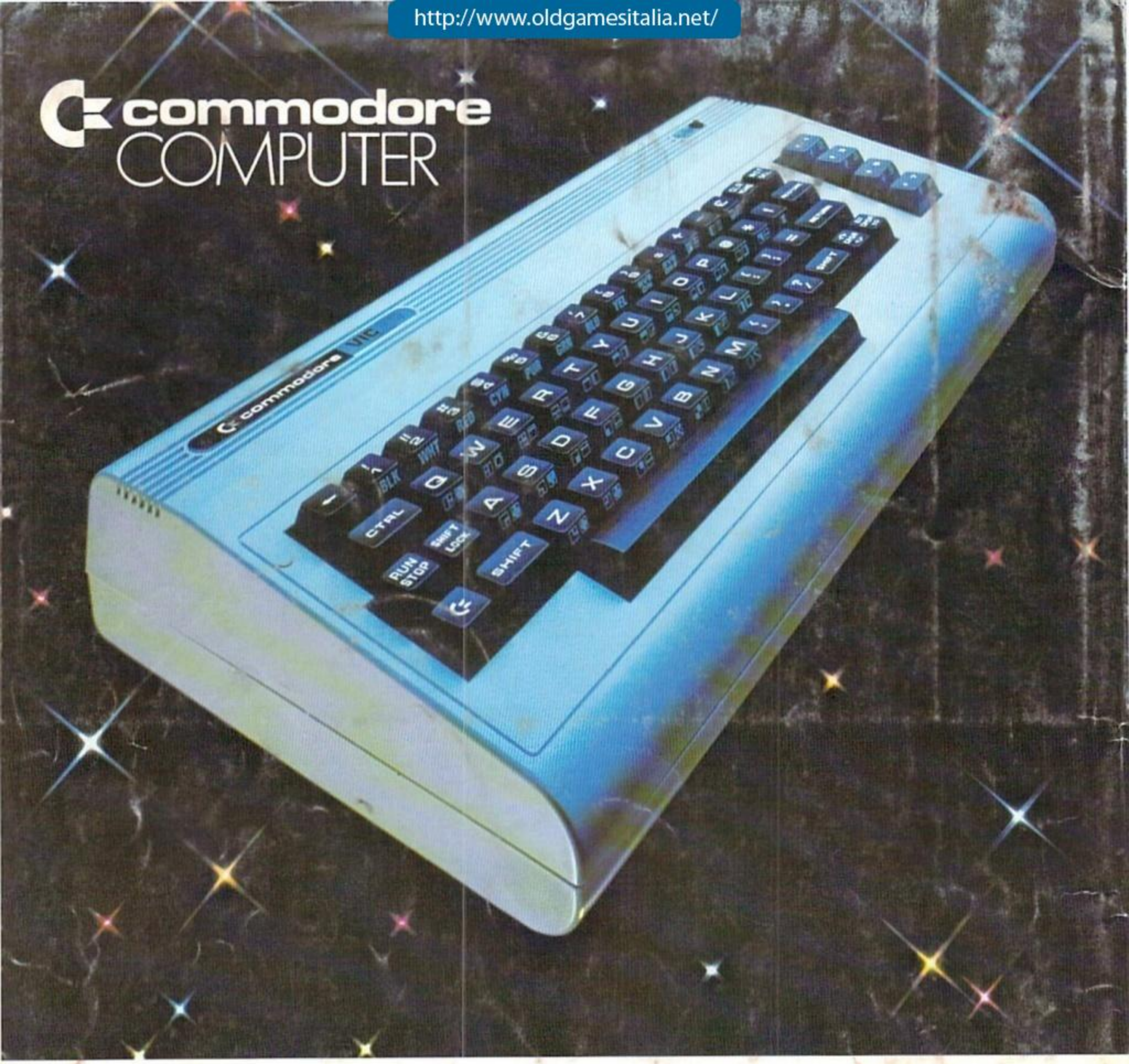

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